6. **David S. Gibson, MBA, MRC**
   Vocational Economics, Inc.
   799 Roosevelt Rd.
   Building 6, Suite 208
   Glen Ellyn, IL 60137

David Gibson is a vocational economist. He will initially discuss his training and expertise in the field of vocational economics. He will discuss his practice and experience and will authenticate his *curriculum vitae*, attached as **Exhibit H**, and discuss his qualifications and credentials as a vocational economist. Mr. Gibson's testimony list and Fee agreement is attached as **Group Exhibit I**.

Mr. Gibson's signed reports reflecting his economic analysis for Dr. Yarkony's life care plan and his vocational economic assessment of C.B. lifetime wage is attached to this disclosure as **Group Exhibit J**. His opinions and bases are contained within the reports.

Mr. Gibson will review and rely upon certain demonstrative exhibits to aid the jury in understanding his testimony. He will testify these aids are a fair and accurate representation of the information depicted and will aid him in testifying before the court and jury.

The bases for Mr. Gibson's testimony include his training, experience, education and observations, his review of records, and more specifically, the items set forth in the list attached as **Exhibit K**.

VOCATIONAL ECONOMICS INC.

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November 21, 2019

Mr. Kevin Burke
Attorney at Law
Coplan & Crane
1111 Westgate Street
Suite 101
Oak Park, IL 60301

RE: C.B.

Dear Mr. Burke:

The attached Medical Care Cost Summary reveals that the monies needed by C.B. for future health and medical care are stated in a range of $27,637,433 to $32,974,580. The figures are stated in terms of present value, based upon the range of treatment options and treatment costs of the underlying life care plan. These figures consider appropriate rates of interest and medical care increases in the areas of commodities and services.

The present value of C.B. future health and medical care costs broken out by Dr. Yarkony's categories is shown in Figure 1.

Figure 1 - Present Value of Medical Costs by Cost Category

Cost Category	Present Value of Medical Costs
Medications[1]	$841,187
Disposable Supplies	$221,997
Future Feeding Supplies	$97,331
Durable Medical Equipment	$259,184
Additional Medical Care[2]	$325,876 to $380,189
Assistance at Home	$23,303,402 to $28,105,357
Therapy Until Age 21	$1,872,340 to $2,299,220
Wheelchair Accessible Van	$631,319 to $685,318
Home Modifications	$84,797
Total	**$27,637,433 to $32,974,580**

[1] Medications will vary over his lifetime according to Dr Yarkony.
[2] Dr. Yarkony opines C.B. is at risk for substantial additional costs for the treatment of complications, hospitalizations and emergency room visits.

Table 1 examines the interrelationship over time between the rate of medical cost changes and the rate of interest. An inspection of the table reveals fluctuation over time. However, the real rates remain relatively constant. Our present value calculation based on historical 60-year average assumes that similar trends will persist in the future.

Please advise if further information is desired.

Sincerely,
VOCATIONAL ECONOMICS, INC.

For the Firm

David S. Gibson, MBA, MRC

/mg

Table 1

Source	Indices	Nominal or Real*	1958-2018	1968-2018	1978-2018	1988-2018	1998-2018	2008-2018
1a	All Items	Nom	3.7%	4.0%	3.4%	2.5%	2.2%	1.6%
		Real	-	-	-	-	-	-
1b	Medical Services	Nom	5.8%	6.0%	5.5%	4.5%	3.8%	3.0%
		Real	2.0%	1.9%	2.0%	2.0%	1.6%	1.4%
1c	Hospital & Related	Nom	7.5%	7.8%	7.1%	6.2%	5.7%	5.0%
		Real	3.7%	3.7%	3.6%	3.6%	3.4%	3.3%
1d	Commodities	Nom	3.6%	4.4%	4.5%	3.4%	2.7%	2.6%
		Real	-0.1%	0.4%	1.1%	0.9%	0.5%	1.0%
1e	Professional Svcs.	Nom	4.8%	5.0%	4.5%	3.4%	2.7%	2.0%
		Real	1.1%	1.0%	1.1%	0.9%	0.5%	0.4%
2	Compensation	Nom	4.9%	4.9%	4.2%	3.4%	3.2%	2.2%
		Real	1.2%	0.9%	0.8%	0.9%	1.0%	0.6%
3	Interest	Nom	4.7%	4.8%	4.5%	3.0%	1.8%	0.4%
		Real	1.0%	0.8%	1.1%	0.5%	-0.4%	-1.2%

1 U.S. Bureau of Labor Statistics. 2018. Consumer Price Index, All Urban Consumers (CPI-U), U.S. City Average. Accessed March 2019. http://data.bls.gov/cgi-bin/srgate.

1a Use Series CUUR0000SA0.

1b Use Series CUUR0000SAM2.

1c Use Series CUUR0000SEMD. The Hospital Services index was first published in 1978. Prior years are imputed by the long-term relationship between Hospital Services and Medical Services.

1d Use Series CUUR0000SAM1.

1e Use Series CUUR0000SEMC. The Professional Services index was first published in 1967. Prior years are imputed by the long-term relationship between Professional Services and Physician Services.

2 U. S. Bureau of Labor Statistics. 2018. Major Sector Productivity and Costs Index: Business Sector, Hourly Compensation. Accessed March 2019. http://data.bls.gov/cgi-bin/srgate (use Series ID #: PRS84006103).

3 Federal Reserve Bank. 2018. 3-Month Treasury Bill Secondary Market Rate Discount Basis. Accessed March 2019. https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15.

* Nominal rates represent the geometric mean of the change in indices from the beginning to the end of the respective periods. Real rates remove the general rate of inflation (All Items) from the nominal values.

updated 3/12/19

Group Exhibit J

Life Care Plan for: C.B.

Attorney: Kevin Burke

Planner: Gary M. Yarkony, MD

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value

Present Age:	3
Life Expectancy:	73.6
Age of Death:	76.6

Rates Used (Real)

Type	*Abbr*	*Grow.*	*Disc.*	*Net.*
General Items	CPI	0.0%	1.0%	1.00% Disc
Commodities - Medical	MC	-0.1%	1.0%	1.10% Disc
Services - Medical	MS	2.0%	1.0%	0.99% Grow
Hospital and Related Services	HS	3.7%	1.0%	2.67% Grow
Compensation	CMP	1.0%	1.0%	0.00% Disc
Professional Services	PRSV	1.0%	1.0%	0.00% Disc

Analyses Included

1 Base Case

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Medications								
Prevacid ODT 15mg	MC	All	Now to Life Expectancy	73.6	Monthly	$5,454.60	$401,459	$274,214
B-6 25ml	MC	All	Now to Life Expectancy	73.6	Monthly	$21.60	$1,590	$1,086
Lactulose	MC	All	Now to Life Expectancy	73.6	Monthly	$293.16	$21,577	$14,738
Topiramate 20mg/ml	MC	All	Now to Life Expectancy	73.6	Monthly	$1,701.00	$125,194	$85,513
Baclofen 10mg/ml	MC	All	Now to Life Expectancy	73.6	Monthly	$1,471.68	$108,316	$73,984
Valproic Acid	MC	All	Now to Life Expectancy	73.6	Monthly	$323.16	$23,785	$16,246
Ranitidine 15mg/ml	MC	All	Now to Life Expectancy	73.6	Monthly	$819.72	$60,331	$41,209
Senna Syrup	MC	All	Now to Life Expectancy	73.6	Monthly	$215.88	$15,889	$10,853
Cetirizine	MC	All	Now to Life Expectancy	73.6	Monthly	$143.28	$10,545	$7,203
Flovent Inhaler 220mcg	MC	All	Now to Life Expectancy	73.6	Monthly	$5,384.76	$396,318	$270,703
Albuterol HFA Inhaler	MC	All	Now to Life Expectancy	73.6	Monthly	$903.84	$66,523	$45,438
Medications Totals								
			Analysis: All Analyses					
					Commodities - Medical (1.10% Disc)		$1,231,527	$841,187

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Disposable Supplies								
60cc Syringes	MC	All	Now to Life Expectancy	73.6	Monthly	$252.00	$18,547	$12,669
6ml Syringes	MC	All	Now to Life Expectancy	73.6	Monthly	$93.60	$6,889	$4,705
Extensions	MC	All	Now to Life Expectancy	73.6	Monthly	$777.60	$57,231	$39,092
Feeding Button	MC	All	Now to Life Expectancy	73.6	Monthly	$808.32	$59,492	$40,636
Gloves	MC	All	Now to Life Expectancy	73.6	Monthly	$206.40	$15,191	$10,376
Diapers	CPI	All	Now to Life Expectancy	73.6	Monthly	$1,836.00	$135,130	$95,329
Wipes	CPI	All	Now to Life Expectancy	73.6	Monthly	$369.60	$27,203	$19,190
Disposable Supplies Totals								
Analysis: All Analyses								
					Commodities - Medical (1.10% Disc)		$157,350	$107,478
					General Items (1.00% Disc)		$162,333	$114,519
							$319,683	**$221,997**

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Future Feeding Supplies								
Bags	MC	All	Now to Life Expectancy	73.6	Monthly	$1,702.92	$125,335	$85,609
Feeding Pump	MC	All	Now to Life Expectancy	73.6	3-year intervals	$233.17	$17,161	$11,722
Future Feeding Supplies Totals								
			Analysis: All Analyses					
					Commodities - Medical (1.10% Disc)		$142,496	$97,331

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Durable Medical Equipment								
Manual Wheelchair	MC	All	Now to Life Expectancy	73.6	5-year Intervals	$1,163.00	$85,597	$58,466
Shower Chair - Until Age 12	MC	All	Now to Age 12	9	3-year intervals	$64.33	$579	$548
Shower Chair - After Age 12	MC	All	Age 12 to Life Expectancy	64.6	3-year intervals	$900.00	$58,140	$37,573
Wheelchair Cushion	MC	All	Now to Life Expectancy	73.6	3-year intervals	$150.00	$11,040	$7,541
Rifton Gait Trainer	MC	All	Now to Life Expectancy	73.6	3-year intervals	$272.67	$20,069	$13,708
Leckey Stander	MC	All	Now to Life Expectancy	73.6	5-year Intervals	$773.80	$56,952	$38,900
Sleep Safe Bed	MC	All	Now to Life Expectancy	73.6	10-year Intervals	$871.20	$64,120	$43,797
Leckey Seating Chair	MC	All	Now to Life Expectancy	73.6	3-year intervals	$1,166.67	$85,867	$58,651
Durable Medical Equipment Totals								
Analysis: All Analyses								
					Commodities - Medical (1.10% Disc)		$382,364	$259,184

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Additional Medical Care								
Neuro, Gas, Diet, Oph, Rehab, Labs, Gen	MS	All	Now to Life Expectancy	73.6	Annually	$3,000.00 to $3,500.00	$220,800 to $257,600	$325,876 to $380,189

Group Exhibit J

Life Care Plan for: C.B.

Attorney: Kevin Burke

Planner: Gary M. Yarkony, MD

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Assistance at Home								
LPN/RN/CAN	PRSV	All	Now to Age 12	9	185 Times per Year	$36,630.00 to $44,030.00	$329,670 to $396,270	$329,670 to $396,270
	PRSV	All	Now to Age 12	9	70 Times per Year	$41,580.00 to $49,980.00	$374,220 to $449,820	$374,220 to $449,820
	PRSV	All	Now to Age 12	9	110 Times per Year	$43,560.00 to $52,360.00	$392,040 to $471,240	$392,040 to $471,240
	PRSV	All	Age 12 to 18	6	185 Times per Year	$73,260.00 to $88,060.00	$439,560 to $528,360	$439,560 to $528,360
	PRSV	All	Age 12 to 18	6	70 Times per Year	$55,440.00 to $66,640.00	$332,640 to $399,840	$332,640 to $399,840
	PRSV	All	Age 12 to 18	6	110 Times per Year	$87,120.00 to $104,720.00	$522,720 to $628,320	$522,720 to $628,320
	PRSV	All	Age 18 to 21	3	185 Times per Year	$73,260.00 to $88,060.00	$219,780 to $264,180	$219,780 to $264,180
	PRSV	All	Age 18 to 21	3	70 Times per Year	$55,440.00 to $66,640.00	$166,320 to $199,920	$166,320 to $199,920
	PRSV	All	Age 18 to 21	3	110 Times per Year	$87,120.00 to $104,720.00	$261,360 to $314,160	$261,360 to $314,160
	PRSV	All	Age 18 to 21	3	365 Times per Year	$71,540.00 to $87,600.00	$214,620 to $262,800	$214,620 to $262,800
	PRSV	All	Age 21 to Life Expectancy	55.6	365 Times per Year	$289,080.00 to $347,480.00	$16,072,848 to $19,319,887	$16,072,848 to $19,319,887
	PRSV	All	Age 21 to Life Expectancy	55.6	365 Times per Year	$71,540.00 to $87,600.00	$3,977,624 to $4,870,560	$3,977,624 to $4,870,560
Assistance at Home Totals								
Analysis: All Analyses								
					Professional Services (0.00% Disc)		$23,303,402 to $28,105,357	$23,303,402 to $28,105,357

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Therapy								
Physical Therapy - Until Age 21	PRSV	All	Now to Age 21	18	50 Times per Year	$27,000.00	$486,000	$486,000
Occupational Therapy - Until Age 21	PRSV	All	Now to Age 21	18	50 Times per Year	$23,250.00	$418,500	$418,500
Speech Therapy - Unitl Age 21	PRSV	All	Now to Life Expectancy	73.6	50 Times per Year	$13,150.00 to $18,950.00	$967,840 to $1,394,720	$967,840 to $1,394,720
Therapy Totals								
			Analysis: All Analyses					
					Professional Services (0.00% Disc)		$1,872,340 to $2,299,220	$1,872,340 to $2,299,220

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Wheelchair Asscessible Van								
2020 Chrysler Pacifica or Voyageur	CPI	All	Now to Life Expectancy	73.6	5-year Intervals	$12,159.00 to $13,199.00	$894,902 to $971,446	$631,319 to $685,318

Group Exhibit J

Life Care Plan for: C.B.

Attorney: Kevin Burke

Planner: Gary M. Yarkony, MD

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Home Modifications								
Modifications for Accessibility	CPI	All	Now to Age 4	1	One Time	$85,645.00	$85,645	$84,797

Group Exhibit J

Item	Rate	Anals	Duration	Yrs.	Frequency	Annual Cost	Current Cost	Present Value
Analysis Totals								
Analysis: Base Case								
						Commodities - Medical (1.10% Disc)	$1,913,737	$1,305,180
						General Items (1.00% Disc)	$1,142,880 to $1,219,424	$830,635 to $884,634
						Professional Services (0.00% Disc)	$25,175,742 to $30,404,577	$25,175,742 to $30,404,577
						Services - Medical (0.99% Grow)	$220,800 to $257,600	$325,876 to $380,189
						Grand Total	**$28,453,159 to $33,795,338**	**$27,637,433 to $32,974,580**

Group Exhibit J

VOCATIONAL ECONOMICS INC.

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November 25, 2019

Mr. Kevin Burke
Attorney at Law
Coplan & Crane
1111 Westgate Street
Suite 101
Oak Park, IL 60301

RE: C.B.

Dear Mr. Burke:

The loss of earning capacity sustained by C.B. is in a range of $2,039,723 to $2,694,989 stated in terms of present value. Enclosed is our report on your client.

The vocational economic assessment contains our conclusions regarding lost earnings as well as the relevant factors supporting those conclusions. The vocational economic rationale presents both the philosophy and the methodology employed in assessing the loss. The method is used to assess earning capacity in all cases of either partial or total disability. It is the standard employed by our firm in conducting a vocational economic assessment.

The projections in this report are based on information received to date and may be updated upon receipt of additional information.

Sincerely,
VOCATIONAL ECONOMICS, INC.

For the Firm

David S. Gibson, MBA, MRC

/mg

VOCATIONAL ECONOMICS INC.

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VOCATIONAL ECONOMIC ASSESSMENT FOR C.B.

Date of Interview:	November 22, 2019
Date of Report:	November 25, 2019
Date of Birth:	September 24, 2016
Age:	3
Educational Attainment:	Mother (Cortney Kaiser) - some college education but no degree; Father (Timothy Babler - high school diploma; C.B. - preschool with IEP
Work History:	Mother - bank associate; Father - farmer, construction laborer.
Date of Injury:	September 24, 2016
Nature of Injury:	Brain injury during birth as a result of alleged medical malpractice
Reported Problems:	Frequent pain from tight muscles; Standing and walking; Climbing; Lifting sedentary weights only; Memory; Following directions; Making decisions; Loss of vision; Speech delays; Limited use of both hands/arms; Fingering; Assistance with all activities of daily living; 24-hour care.
Information Reviewed:	Deposition of Cortney Kaiser; Life Care Plan, Dr. Yarkony;

Individual Education Plan;
Deposition of Dr. Ward;
Deposition of Dr. Schuman.

Case Comments

Upon your request, an assessment was made of C.B. loss of capacity to perform work and earn money as a result of injury sustained on September 24, 2016. In conducting the assessment, C.B. mother (Cortney Kaiser) was interviewed on November 22, 2019 and information forwarded by your office was reviewed.

A standard vocational interview and the information reviewed reveal C.B. to be a 3-year-old individual who attends preschool with and Individual Education Plan. His mother obtained some college education but no degree, and his father obtained a high school diploma. Before becoming C.B. caregiver, his mother functioned as a bank associate. His father functions as a farmer and construction laborer.

In September 2016, C.B. sustained a brain injury during birth as a result of alleged medical malpractice. His mother states that as a result of injury, C.B. experiences a variety of difficulties as listed in the *Reported Problems* section of this report.

In assessing loss of lifetime earnings, a variety of issues need to be considered. Assessment of lifetime earning capacity includes consideration of preinjury and postinjury annual earning capacity and preinjury and postinjury worklife expectancy. Once these are determined, present value is calculated. In considering the effects of C.B. disability on annual earning capacity and worklife expectancy, we used data from the US Census Bureau's American Community Survey (ACS) dealing with mobility, cognitive, vision, hearing, and/or physical disability.

Annual Earning Capacity

Preinjury, we consider three levels of education: high school, some college education but no degree and associate degree.[1] In each analysis, C.B. preinjury lifetime power to earn money is reasonably represented by the education-specific median age-earnings profile (AEP)[2] that accrues to males without a disability stated in terms of 2019 dollars. [3]

[1] According to the 2018 ACS, 93% of similarly situated Rockford-Freeport-Rochelle, IL area residents achieve at least a high school degree. For an associate degree the rate is 31%.
[2] The economic concept of the Age Earnings Cycle is based on the high correlation between age and earnings in that as we become older our earnings tend to increase. This is based on the fact that as we develop experience in a particular task, we become more productive in that task and the labor market will pay a premium for enhanced productivity.
[3] We employ national statistics for the expected earnings of a child since his domicile as an adult is unknown. According to data from the ACS, males with a high school diploma in Freeport, Illinois earn at the rate of 9.1% above their national counterparts. Males with some college education but no degree in Freeport, Illinois earn at the rate of 1.9% above their national counterparts. Males with an associate degree in Freeport, Illinois earn at the rate of 4.0% below their national counterparts.

Due to the severity of his multiple disabilities, as indicated in Dr. Yarkony's report, C.B. will be unable to participate in competitive employment in the future. Therefore, he is 100% occupationally disabled as a result of injury.

Fringe benefits will be added in all scenarios at the national average excluding Medicare rate of 25.6%.

The earning capacities considered for C.B. are depicted in Figure 1 and Table 1 as follows.

Figure 1: Full-time, Nondisabled, Median Earnings

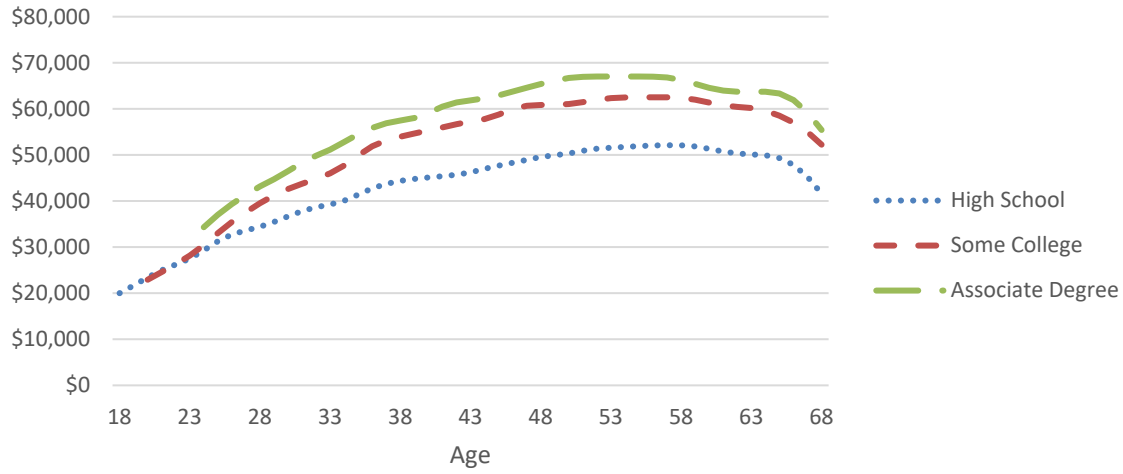

Table 1 Lifetime Average Earning Capacity

Level of Education	Preinjury	Postinjury
High School Diploma	$42,700	$0
Some College Education but No Degree	$51,988	
Associate Degree	$56,480	

Worklife Expectancy

C.B. preinjury worklife expectancy is education-specific and like that of an average male without a disability. Consistent with our earning capacity scenarios, we consider C.B. to be 100% occupationally disabled, with a postinjury worklife expectancy of 0 years.

The worklife expectancies that follow are for males beginning at age 18, 20, and 21.

Table 2 Total Worklife Expectancy

Level of Education	Preinjury	Postinjury
High School Diploma (age 18)	38.0 years	0 years
Some College Education but No Degree (age 20)	37.7 years	
Associate Degree (age 21)	38.0 years	

Lifetime Loss

The attached Worklife Probability tables calculate C.B. loss of lifetime expected earnings. The present value figure assumes that future increases in real wage growth will be offset by the real rate of interest or discount over the remaining worklife expectancy. This assumption is supported by the long-term relationship between the rate of return on a conservative investment, such as a 91-day Treasury Bill, and the growth in labor market compensation.

The table below summarizes C.B. loss of earnings.

Table 3 Loss of Earning Capacity

Preinjury Level of Education	Loss
High School Diploma	$2,039,723
Some College Education but No Degree	$2,462,540
Associate Degree	$2,694,989

The projections presented in this report are based on information received to date. Our analysis may be updated or changed upon receipt of new information.

VOCATIONAL ECONOMIC RATIONALE

In cases of permanent disability or death, a lifetime loss of future earning capacity results. A Vocational Economic Assessment (VEA) defines the loss in terms of present value. This Vocational Economic Rationale (VER) presents both the philosophy and the methodology employed in these assessments. The method is used in cases of either partial or total disability. It is the standard employed by Vocational Economics, Inc., in conducting a VEA.

Introduction

The U.S. Supreme Court's decisions in *Daubert* (1993) and *Kumho* (1999) require that expert testimony meet the general tests of "reliability" and "relevancy." The Court, however, has recognized the inexact nature of assessments for lost earnings. In *Jones and Laughlin Steel v. Pfeifer* (1983), the Court stated that:

> By its very nature the calculation of an award for lost earnings must be a rough approximation. Because the lost stream can never be predicted with complete confidence, any lump sum represents only a "rough and ready" effort to put the plaintiff in the position he would have been in had he not been injured.

More than thirty years after the *Jones and Laughlin Steel v. Pfeifer* case, one might argue that improved Census Bureau data enable the expert to provide an empirically-based “rough and ready” effort to make the plaintiff economically whole. However, the expert opinion is still an estimate. It is not an absolute statement of what will occur for a plaintiff. No such opinion could ever be stated; rather, the expert defines what probability data tell us about persons most like the plaintiff, using both the best data available and clinical judgment. It is up to the trier of fact to make the ultimate decision as to what is most probable for the plaintiff in terms of future loss of earning capacity.

As an aid to the trier of fact, experts consider available statistics on disability when developing their opinions. The data from every macro survey conducted on the impact of disability on earnings and employment reach the same conclusions. Disability, regardless of how it is defined, reduces earnings for persons employed year-round, full-time. In addition, disability reduces employment across all levels of educational attainment. Employment levels serve as one of the primary building blocks of a worklife expectancy. Therefore, worklife expectancy is reduced. The best data available emanate from U.S. government surveys on disability.

A VEA is a forecast of future lost earnings based on diminished earning capacity. In conducting the assessment, vocational and economic experts consider the unique characteristics of the individual being assessed in combination with relevant career development and economic theory. Experts apply population statistics to individuals to predict a variety of future probable occurrences.

As noted by Marcia Angell in *Science on Trial* (1997 , 115):

> Courtroom trials are not about populations, they are about individuals. . . . We have no basis, at least in the current state of knowledge, for making a judgment about a particular woman. We therefore must appeal to epidemiological data – that is, studies of populations.

As stated by Gibson (2001, 21), "Statistical averages have long been accepted as a means for prediction – life expectancy, earnings, and others – and have long been accepted for use in the courts. No statistic, no matter how fine-tuned, can provide an exact predictor of an individual's future." Nonetheless, utilizing statistical methodologies is a powerful method for arriving at a more empirically-based opinion.

Earnings proxies and worklife expectancies are derived from average rates for various populations. Experts use available statistics about populations and apply them to meet the specifics of the case by considering how earnings or worklife expectancy statistics match the plaintiff's circumstances and characteristics. Data are used by persons who understand the principles on which they are based and the population to which they are applied.

The purpose of this VER is to define the principles underlying assessments of lost earnings as well as the methodology employed in conducting a VEA. A previous edition of this VER has been published in its entirety in the peer-reviewed journal *Estimating Earning Capacity: A Journal of Debate and Discussion* (Gamboa, Tierney, et al. 2009).

Disability Issues

The presence of a disability is widely known to affect both earnings and worklife expectancy. This finding is documented in the results of every major survey that has attempted to study the impact of disability, including:

- The Annual Social and Economic Supplement (ASEC, or the March Supplement) to the Current Population Survey (CPS), the Survey of Income and Program Participation (SIPP), and the American Community Survey (ACS) from the U.S. Census Bureau (2019);
- The monthly Current Population Survey from the U.S. Bureau of Labor Statistics and U.S. Census Bureau;
- The National Health Interview Survey (NHIS) from the National Center for Health Statistics (Harris, Hendershot and Stapleton October 2005);
- The *N.O.D./Harris Survey of Americans With Disabilities* (Harris Interactive 2000); and
- The Behavioral Risk Factor Surveillance System (BRFSS) conducted by the Centers for Disease Control and Prevention (Smith 2007)[1].

[1] In addition to the above U.S. surveys that consistently demonstrate reductions in earnings and worklife for the disability population, Canada's Participation and Activity Limitation Survey (PALS) also identifies reductions. Crouse, Joseph T. 2015. "Worklife Expectancies for Individuals with Disability: A Comparison Between the United States and Canada". *The Rehabilitation Professional* 23(2): 93-100.

The importance of tracking the employment impact of disability is highlighted in the U.S. Census Bureau's website focusing on many of the above surveys (2019).

The disability effect is the cause of such events as the passage of the Americans with Disabilities Act (ADA),[2] the existence of the U.S. Department of Labor's Office of Disability Employment Policy,[3] and the development of the profession of rehabilitation counseling.

Defining Disability

Before measuring the effect of disability on earnings and employment, it is necessary to define what is meant by disability. Depending on the desired focus, different groups and surveys will define disability differently. Brault (2012) notes that "no one survey estimate is 'right' or 'wrong' as all surveys must make choices about the type and nature of disability they intend to measure."

As noted in *Counting Working-Age People with Disabilities*, (Houtenville, Stapleton, et al. 2009, 28), "The Interagency Committee on Disability Research (ICDR) documents 67 acts or programs that define disability." The ADA, for instance, defines disability as existing in persons with a physical or mental impairment that substantially limits one or more of the major life activities. The Veterans Administration (VA) and the Social Security Administration (SSA) each have their own definitions, which vary considerably. Haber (December 1967, 17, 20) provides a general definition of disability:

> Literally interpreted, disability refers to "loss or reduction of ability." Definitions in use in clinical studies, survey research, and administrative evaluations commonly accept the loss or reduction of capacity to engage in normative role activities as the central point of reference of disability, with an origin in impairments or functional limitations resulting from disease or injury.

Haber goes on to note that:

> Disability is distinguished from functional limitations by its relationship to the required capacities for the performance of normal roles and activities. Disability represents a loss or decrease in ability to respond to behavioral expectations as a result of impairments and functional limitations.

Given this basic definition, there are various surveys that provide disability data that can be useful for a calculation of lifetime earnings.

Impairment – Disability – Work Disability

It is important to differentiate between the terms impairment, disability, and work disability. The lack of understanding regarding the differences between these terms is responsible for some of the criticisms leveled at work disability data.

[2] http://www.ada.gov/
[3] http://www.dol.gov/odep

A physician typically defines impairment. Usually anatomical in nature, impairment may be defined as a percentage of physical functional impairment to the body as a whole. It establishes permanency, which is one value of an impairment rating in cases of personal injury. Typically, if there is no permanency of impairment, there is no future lifetime loss of earning capacity. Permanency of impairment may also be established by psychologists and neuropsychologists in cases involving traumatic brain injury (TBI), other acquired brain impairment, Post Traumatic Stress Disorder (PTSD), or severe psychological disturbances.

Disability is defined as existing when an individual is limited in terms of one or more activities of daily living, but not all impairments result in a disability. A one percent permanent partial impairment to the body as a whole as a result of an amputation of the ring finger of the non-dominant hand at the distal phalangeal joint would not likely result in either a disability or a work disability. Similarly, a disability resulting from impairment does not necessarily result in a work disability. A five percent permanent partial impairment to the body as a whole relating to injury and a subsequent back fusion may or may not result in a work disability even if it limits one or more activities of daily living such as yard care, home maintenance, jogging, golfing, or snow skiing.

Note that the definition of a disability derives from functional limitations - not the injury that caused the limitations. If a person is limited in his ability to walk, the impact on his employment is driven by his inability to walk, not by whether it arose from a fall resulting in a spinal cord injury or an automobile accident resulting in amputation of his leg. Thus, this rationale focuses on employment outcomes for a given limitation. Further, one must distinguish between limitations and restrictions. Physicians often identify permanent limitations (impairments) a patient might have without restricting their activities. It is the limitations that drive the assessment of a disability, regardless of the presence of restrictions.

If the individual with a back injury and fusion is a social worker or a rehabilitation counselor, it is possible that a work disability would not exist. However, if chronic pain exists and a future fusion or fusions are probable, it is likely that a decrease in both earnings and worklife expectancy would result. Chronic pain decreases the amount of work an individual is capable of performing, which results in a decreased level of productivity (Kapteyn, Smith and Van Soest March 2006). In addition, the aging process has been shown to exacerbate the impact of disability on earnings (Gamboa and Gibson 2008) and employment (Gamboa and Gibson, Gamboa Gibson Worklife Tables Revised 2015).

Work disability is defined by the U.S. Census Bureau (1983) as existing when a condition exists that limits the amount or kind of work an individual is capable of performing because of a physical or mental impairment. This definition is narrowly constructed.[4] It is not meant to define the prevalence of disability, but rather the earning and employment levels of those persons with a work disabling condition. Some argue that the data are too heterogeneous to be of value in that a wide range of physical maladies encompass the group.[5] However, the data are homogeneous and specific to those with a work disabling condition, the very type of individual seeking compensation for future economic loss as a result of a tort. The issue of work disability is supported in a report

[4] The Census Bureau later expanded this definition in the CPS, as explained later in this document.
[5] e.g., paraplegia, amputation, back sprains, knee injuries, back injuries, etc.

published by the Centers for Disease Control, based on information from the 2005 SIPP categorizing disability prevalence (2009).

U.S. government surveys have been used successfully in thousands of partial disability cases over the past thirty-five plus years. As documented throughout this rationale, the data are widely used by prominent disability researchers to measure the employment impact of disability. Recognition of the use of government survey data continues to increase in numerous district court and appellate court decisions. The data serve as an excellent aid to the trier of fact in assessing economic loss in cases of partial disability.

Disability Statistics

Many surveys demonstrate the effect of disability on earnings and employment. However, few offer a sample sufficiently large to quantify this impact by multiple levels of age, education, gender, and disability status. Two robust sources of data specific to both earnings and employment levels that also provide large sample sizes are the American Community Survey (ACS) and the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS), sometimes referred to as the March Supplement to the CPS. Both surveys allow classification of employment and earnings by age, gender, education, and disability versus non-disability status. The ASEC focuses on work disability, while the ACS examines earnings and employment from the functional perspective of mobility, cognitive, vision, hearing, and physical disability.

American Community Survey

The U.S. Census Bureau's American Community Survey (ACS), the largest annual survey in the United States, is the only source of statistics on a wide range of important characteristics for all communities (Groves 2012). As such, the Census Bureau recognizes the ACS as the preferred source for examining small geographic areas and finely detailed categories (e.g. disability) on their website under *Guidance on Differences in Employment and Unemployment Estimates from Different Sources* (2017). The survey collects data from participants by asking a series of disability-related questions. The ACS has been conducted since 2000. Since 2005, its annual sample size[6] has been over 3 million persons per year, with annual response rates of 97 percent or more (Groves 2012).

In October of 2014, the U.S. Census Bureau published *American Community Survey: Handbook of Questions and Current Federal Uses* (October 2014). The publication provides examples of how the survey data collected is used. The disability questions are asked to understand the population with disabilities. Federal uses of the data include use by the U.S. Department of Commerce, in conjunction with the FCC, to determine whether residential households own computers and access the internet. The U.S. Department of Health and Human Services uses the disability data collected by the ACS to determine current and projected health care services delivery needs, further noting that health status is related to employment status. In total, the report

[6] The sample is 1% of the U.S. population annually, and is made available in the ACS Public Use Microdata Sample (PUMS).

documents 75 applications of the disability questions within federal agencies alone, 11 of which focus specifically on the impact of disability on employment and earnings. (October 2014, 87-96)

Prior to 2008, the ACS defined disability based on the questions in Figure 1. A physical, cognitive, or sensory disability is considered severe when problems with self-care or going outside the home are also reported. Conversely, VEI analyses consider a nonsevere disability by excluding the severe indicators and all of the other functional limitations.[7] Because work disability is measured with the Current Population Survey, the ACS work disability question is not used in VEI analyses.

Figure 1 ACS Disability Criteria (prior to 2008)

Question	Classification
Does this person have any of the following long-lasting conditions:	
Blindness, deafness, or a severe vision or hearing impairment?	Sensory
A condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying?	Physical
Because of a physical, mental, or emotional condition lasting 6 months or more, does this person have any difficulty in doing any of the following activities:	
Learning, remembering, or concentrating?	Cognitive
Dressing, bathing, or getting around inside the home?	Self-Care
Going outside the home alone to shop or visit a doctor's office?	Go Outside Home
Working at a job or business?	Work

The U.S. Census Bureau adopted a new set of six disability questions (Figure 2) beginning with the 2008 ACS. The physical disability question from the prior survey (see Figure 1), addressed functional limitations pertaining to both the upper and lower body. Beginning in 2008, the questions were refined to be more specific (Figure 2). However, the number of questions remained limited to six. Thus not all limitations tested before 2008 could be included when splitting some former limitations into multiple questions.

The previous physical disability question was tested by both U.S. Bureau of Labor Statistics (BLS) and Census and found to be a reliable measure of disability (Brault, Stern and Raglin 2007) Employment rates generated from the pre-2008 physical disability question will continue to be a valuable source of data with which to calculate worklife expectancy for individuals with functional limitations of the upper body (one limitation not included in the revised six questions). For our

[7] For example, a nonsevere cognitive limitation excludes persons who report a yes response to any of the self-care, go outside the home, physical, or sensory questions.

analyses, the impact of physical disability on earnings and probabilities of employment is measured by use of 2005-07 surveys (U.S. Census Bureau 2008).[8]

Using the 2008 questions, a vision, cognitive, or mobility disability is considered severe when problems with self-care or going outside the home are also reported.

Figure 2 ACS Disability Criteria (beginning 2008)

Question	Classification
Is this person deaf or does he/she have serious difficulty hearing?	Hearing
Is this person blind or does he/she have serious difficulty seeing even when wearing glasses?	Vision
Because of a physical, mental, or emotional condition, does this person have serious difficulty concentrating, remembering, or making decisions?	Cognitive
Does this person have serious difficulty walking or climbing stairs?	Mobility
Does this person have difficulty dressing or bathing?	Self-Care
Because of a physical, mental, or emotional condition, does this person have difficulty doing errands alone such as visiting a doctor's office or shopping?	Go Outside Home

Bureau of Labor Statistics Adoption in Monthly CPS

The U.S. Bureau of Labor Statistics (BLS) adopted the disability questions in Figure 2 from the ACS as their official definition of disability and added them to the monthly CPS in public use data available beginning in 2009. The CPS is the primary source of data used to calculate monthly unemployment rates. This allowed the BLS to release "monthly labor force data from the CPS for persons with a disability." (U.S. Bureau of Labor Statistics 2010)

Calculation of employment rates yielded by the 2009 - 2012 CPS monthly surveys data reveal they are generally consistent with those generated from ACS data. As noted earlier, while the new CPS monthly survey data provide valuable information about the overall employment status of persons with a disability, the much larger sample size of the ACS makes it the preferred source of data for calculating worklife expectancy. The large sample size of the ACS allows for analysis by gender, age, level of education, and disability status.

Work Disability

The CPS is the primary source of labor force characteristics for persons in the United States (U.S. Census Bureau 2019) and the source of the government's monthly unemployment rates that are

[8] The relationships of earnings and employment for persons with physical disabilities to the all persons of the same age and education in 2005-07 is applied to modern ACS results.

widely quoted by the media. The CPS is used for a wide variety of purposes within the Federal government.

In March of every year since 1981, the CPS expands to collect more information on income and employment. The Annual Social and Economic Supplement (ASEC) to the CPS provides earnings and employment data through expanded questions that specifically address work disability. The U.S. Census Bureau began publishing data from the March Supplement in the 1980s (1983) (1989).

The ASEC uses a definition that is specific to persons with a work disability. The survey does not consider specific types of impairment or disability, but instead focuses on whether the individual has work-related limitations because of a physical or mental impairment that limits the individual in terms of performing work (U.S. Census Bureau 2018).

Skoog and Toppino (1999) opine that the CPS March supplement, or ASEC, was never intended as a tool to measure the existence or impact of disability. This is correct. The ASEC measures work disability, which is different from disability. Hale (2001) suggests that the work disability data are unusable because the definition does not match disability as defined by the Americans with Disabilities Act (ADA). However, the ASEC data do not rely on the ADA definition, nor is that definition the best one to use when assessing earning capacity loss.

The U.S. Census Bureau defines work disability as existing when a person meets one or more of the following conditions:

Figure 3 ASEC Work Disability Criteria

Not Severe	Identified by the March supplement question "Does anyone in this household have a health problem or disability which prevents them from working or which limits the kind or amount of work they can do?"
	Identified by the March supplement question "Is there anyone in this household who ever retired or left a job for health reasons?"
	Received VA disability income in previous year
Severe	Identified by the core questionnaire as currently not in the labor force because of a disability that is expected to last for at least six months
	Identified by the March supplement as a person who did not work at all in the previous year because of illness or disability
	Under 65 years old and covered by Medicare in previous year
	Under 65 years old and received Supplemental Security Income (SSI) in previous year

People who say yes to any of the Not Severe questions, but no to all of the Severe questions are classified as being not severely work disabled. Those who say yes to any of the Severe questions are classified as being severely work disabled.[9]

Experts who use the ASEC data specific to a work disabling condition must exercise clinical judgment in order to use the data effectively. In a forensic setting, a permanent physical or mental impairment that is medically or psychologically determined typically must be established in order to assign a reduction in worklife expectancy.

It is important to note that two of the criteria for a severe work disability, "not in the labor force because of a disability that is expected to last for at least six months," and not working "at all in the previous year because of an illness or disability," would not automatically result in assigning a worklife expectancy equal to that of a severe work disability to a specific individual.

The forensic expert must determine whether or not an individual retains the ability to perform some type of substantial gainful work activity. If an individual is employed or clearly capable of employment based on the judgment of the expert, by definition that individual has a nonsevere work disability. This is true even if the individual has been unemployed for multiple years after the date of injury.

Meeting *Daubert* and *Frye* Criteria

Daubert (1993), as expanded by the subsequent *Kumho* (1999) decision, requires that all expert testimony meet the general tests of "relevancy" and "reliability." Since use of disability statistics discussed in this rationale is for measurement of the impact of disability on lost future earnings, it is assumed that the relevancy criterion is met (Gibson 2001).

With regard to "reliability," the Court held that scientific evidence must be "grounded in the methods and procedures of science." *Daubert* provides four flexible factors to determine if the evidence qualifies: testing, peer review and publication, error rates and standards controlling the technique's operation, and general acceptance in the relevant community. As updated by *Kumho*, the court stressed that not all factors may apply with every case, especially in the social sciences. The factors serve as flexible guidelines to assure the expert employs the same level of intellectual rigor as he or she would outside the courtroom when working in the relevant discipline.

Testing

The scientific testing criteria are principally directed at the "hard" sciences and engineering, and have less significance for vocational and economic testimony, which focuses on the future experience of people, which can never be tested or known with absolute certainty. However, data from the ACS and ASEC are produced and extensively tested by the U.S. Department of Commerce, Bureau of the Census. McNeil (n.d., 2) states that the ASEC disability questions are based on survey work carried out by the Social Security Administration (SSA) in the 1960s. The

[9] BLS instituted new questions on disability in the monthly CPS beginning in 2009. The added questions are identical to those used in the American Community Survey beginning in 2008, and are discussed in the previous section focusing on the ACS.

SSA was developing a method to identify "individuals with a condition that prevented them from working or a condition that substantially increased the risk that they would become unable to work." Further, McNeil comments that the work disability question from the ASEC has been asked since 1980, and that the ASEC is an important data source for analysts concerned with the disability worklife dynamic.

Peer Review and Publication

Use of the underlying ACS and ASEC data to measure the impact of disability on earnings and employment is the subject of multiple published and peer reviewed articles. The U.S. Census Bureau recently partnered with the Population Reference Bureau (PRB) and Sabre Systems to form a new American Community Survey Users Group. Its purpose is to improve the understanding of the value and utility of ACS Data and to promote information sharing among its users about key issues and applications. Presentations on VEI's use of the ACS data have been part of the ACS Data Users Conference Programs in 2014 (Gibson 2014), 2015 (Gibson 2015), and 2017 (Gibson 2017) with the 2015 paper and presentation focusing specifically on use of disability data to quantify lifetime loss of earning capacity. Joy (2017) reviews the disability criteria used in the ACS and monthly CPS, and concludes they are appropriate for use within a forensic setting. A bibliography including over 100 publications using the ACS and/or ASEC data is available.

Both government and non-government researchers rely on the ASEC employment rates and earnings figures for nonforensic purposes. Senator Tom Harkin, chairman of the Committee on Health, Education, Labor & Pensions (HELP), introduced bipartisan legislation designed to help young people with disabilities transition successfully from school to higher education. His research and data came directly from the ACS disability data (2012). Burkhauser, Daly and Houtenville (2001) used data from the ASEC to compare the employment experience of people with and without work disability during the 1990s business cycle. This paper was published through the Disability Statistics Rehabilitation Research and Training Center (RRTC) for Economic Research on Employment Policy for Persons with Disabilities at Cornell University and Hunter College. The RRTC has published also several other papers using ASEC data on persons with a work disability. These include a paper by Houtenville (2000) that studied the prevalence, employment rates, and household income of people with a work disability, as well as a paper by Burkhauser, Houtenville, and Wittenburg (2003) that compared the employment trends of persons with work limitations using the ASEC and two other government surveys.

The RRTC publishes an annual disability compendium of disability data from the ACS (Houtenville 2013). It also maintains a statistics "compendium" online, bringing together disability statistics compiled by various federal agencies. Among the information cited are the ACS and the monthly CPS.

The U. S. Bureau of Labor Statistics (BLS) adopted the impairment-based definitions in the ACS to use in the monthly Current Population Survey for purposes of tracking the employment outcomes of persons with disabilities (U.S. Bureau of Labor Statistics 2010). BLS uses these data to publish regular comparisons of the employment rates for persons with and without disabilities (Table A-6 2019). The U. S. Department of Labor's Office of Disability Employment policy also uses the data from the CPS as well as the much larger ACS to track and project the employment impact of disability (Disability Employment Statistics 2018).

Gamboa, et al. (2006), Gamboa (2008), and Crouse and Gamboa (2014) use data from the ACS to discuss the effects of mild traumatic brain injury on both earnings and employment. Gamboa (2006) used the same data to define key issues in assessing economic damages in cases of acquired brain injury. Gamboa and Gibson use both the ACS and ASEC for production of disability-specific worklife expectancy tables (2010) (Revised 2015).

Disabled veterans and individuals receiving Social Security Disability payments are among an expanding component of the current labor market. Researchers such as Tennant (2012) and Meyer and Mok (2013) use ACS data to measure the economic consequences of their disabilities. Another expanding component of the labor market includes Baby Boomers who are entering the ranks of older age. ACS data was recently used to examine the combination of disability and older Americans. Researchers used five year estimates (2008-2012) to examine demographic and socioeconomic characteristics of the older population with disabilities in order to help anticipate future disability prevalence in the older population (He and Larsen 2014).

Error Rate

The error rate is primarily intended to apply to the "hard" sciences and engineering in conjunction with the testing performed in those disciplines (e.g., reliability of a bolt securing a heavy sheet of metal). One can, however, compute the standard error of a worklife expectancy using the formula for the standard error of acceptance. The large sample sizes of the ACS and ASEC surveys assure low standard error rates. Sample size and its relationship to reliability are discussed further in the "Reliability" section below.

General Acceptance in the Relevant Community

The *Daubert* test (as well as the *Frye* decision (1923) still used in many states) requires experts to apply generally accepted methodology. The general acceptance of combining vocational and economic disciplines for a thorough analysis of the impact of disability on employment and earnings was demonstrated by an article in *Forbes*. This article identifies the relationship between physical and/or cognitive injuries and negative impact on financial wherewithal as it relates to the NFL's settlement with impacted players and families (Rishe 2013).

Proof that the ACS and ASEC data meet the General Acceptance burden is offered through the multiple peer reviewed and other publications cited throughout this document. The "relevant community" is the community of rehabilitation researchers who rely on both ACS and ASEC data to determine both earning levels and employment levels for persons with a disability or a work disability. By way of example, Bjelland, Burkhauser, and Houtenville (2008) have regularly used information from the ACS and ASEC in assessing the impact of disability on employment. In addition, as previously mentioned, the Disability Statistics RRTC brings together disability statistics from a variety of federal agencies, including the ACS and the monthly CPS.

Researchers from the Institute for Homeland Security Solutions (IHSS) (Boos, et al. September 2009) used the data from the ACS to measure social vulnerability. The researchers recognize the usefulness of the ACS data in their application, as well as other applications including disability, health, ethnicity and age, and poverty. Their research brief specifically cites a previous article in

Neurorehabilitation (Gamboa 2006), as well as other peer reviewed articles mentioned within this VER.

Perhaps the most thorough exploration of the impact of disability on employment, *Counting Working-Age People with Disabilities* (Houtenville, Stapleton, et al. 2009), uses data from both of these surveys, as well as the NHIS, SIPP, Canadian surveys, and others through a collection of articles authored by fifteen different disability researchers. Specifically, for purposes of computing worklife expectancy, Richards and Donaldson (2010, 99) note in using the ACS and ASEC data that "it is demonstrably a fact that disabled persons as a whole have lower labor force participation rates than those not disabled. By definition, worklife expectancies of those unable to participate in the labor force are reduced, either in full or in part."

Validity

One issue is the question of the validity of ACS and ASEC data in estimating earnings and employment levels. Validity refers to whether or not the data collected measure what they are designed to measure, i.e., earnings and levels of employment. If we were talking about a test, then the question would be, "Does the instrument test what it is intended to test?" If we are talking about sampling, then the question would be, "Does the sample accurately reflect the population in question?"

There are different types of validity, but the over-arching type is construct validity. In a VEA, the constructs in question are the earnings and employment levels of the populations of persons without and with a disability. The question is, "Do the samples of data we have at hand (ACS and ASEC) accurately measure the earnings and employment levels of persons without and with a disability?"

In order to assess the accuracy of the data, we look at other types of validity: face validity and content validity. Face validity refers to the extent to which the sample looks like the population in question. Content validity in this context refers to the questions asked of the participants in the sample, namely their earnings and employment history.

The ACS and ASEC have both face validity and content validity in that the samples are taken from populations of individuals who are defined as nondisabled or disabled and these individuals are questioned about their employment and earnings. There is also convergent validity, in that the two data sets that purport to be assessing/measuring the same construct are in agreement to an acceptable degree.

Both the ACS and ASEC samples are in agreement in very important dimensions. Both sets of data show that earnings and employment levels for the nondisabled and disabled population are in the direction that is expected. Those with disability show lower earnings and lower levels of employment than nondisabled individuals. It can also be concluded that the ACS and ASEC data have concurrent validity, in that the data have the ability to distinguish between two groups that should theoretically be different, i.e. nondisabled vs. disabled.

One should note that validity is always a matter of degree and not a black or white issue. Validating a construct/theoretical relationship is always a matter of degree. For example, even before the ACS

data were published, judgments and decisions were made based on ASEC data. The ACS data could be considered a further refinement and validation of the theoretical relationship between earnings, employment, and disability.

Reliability

Another issue is the question of the reliability of ACS and ASEC data in estimating earnings and employment levels. Reliability refers to the consistency or the repeatability of a measurement operation. For example if we were measuring the intelligence of an individual, we would want to obtain the same IQ score or nearly the same IQ score each time the individual was evaluated using the same test of intelligence. Likewise, if we take repeated samples of a defined population of people, we would hope to obtain similar scores for each sample. It is important to note that high reliability does not necessarily mean high validity. There can be high reliability, but no validity. For example, we might obtain highly reliable and consistent measures of swimming speed, but these data would not be valid with regard to the mathematic ability of the swimmers. Reliability is necessary, but it is not a sufficient condition for validity. Reliability refers to the precision of measurement of a sample; validity refers to the accuracy of the sample in representing the characteristics of the population.

In assessing reliability, the size of the sample is of critical importance. The larger the sample size is, the more inclusive and representative the sample becomes of the general population. Therefore, opinions and conclusions based on the data can be drawn with a higher degree of confidence that the results would match a census of the general population. Both the ACS and ASEC use very large samples. The sample size of the ASEC is more than 100,000 individuals annually. The ACS sample size is in excess of three million. Therefore, it would be expected (and is true) that the potential error would be extremely small for both sets of data, and the overall data sets would be expected to be highly reliable.

Issues in Validity and Reliability

It must be stressed that by its very nature statistical data always have limitations. Many times, the limitations of statistical data can be improved by collecting still more data. For example, the methods by which individuals are classified as being disabled or nondisabled and degree or type of disability could be investigated from the standpoint of inter-rater reliability, which measures the consistency of the individuals doing the judging or categorizing of persons with a disability. Likewise, a longitudinal study following a group of individuals over a lifetime of work could provide a goldmine of useful data. However, the factors limiting such data-collection projects are always time and costs. It would take upwards of 40 years to complete the longitudinal study contemplated in this paragraph.

In the meantime, the ACS and ASEC data sets are the largest and best available for measuring earnings and employment levels for persons without and with a disability. Recent research by Joy (Joy 2017) measured the reliability of the six disability questions based on longitudinal data over a sixteen-month period, finding stability in the disability measures across time, with both the physical and mobility questions being the most stable. A qualified expert must understand the

nature of the data and exercise clinical judgment specific to the individual being evaluated. It is the combination of understanding the data and clinical judgment that can best aid the trier of fact.

It is generally accepted that rational decision-making requires the use of both probability statistics and professional judgment (Rubin 2003). While the U.S. Census data that emanate from both the ACS and ASEC provide an excellent data source for defining both earnings and employment levels for persons without and with various types of disability, applying the data to a specific individual requires a thorough understanding of the data in combination with an understanding of the unique traits and characteristics of the individual with a disability. Professional judgment by the forensic expert is necessary to determine from which population to draw the statistics to measure the expected earnings and employment rates of a given plaintiff.

The Effect of Disability

Two facts exist for persons with a disability. The first is that on average, when such persons work year-round, full-time, they earn less than counterparts without a disability. Second, they experience lower levels of labor market participation and employment, which when considered in the aggregate, produce lower levels of worklife expectancy than those without a disability. These two facts combine to produce a probable reduction of lifetime expected earnings for persons with a disability.

These facts are supported by data from the ACS, the ASEC, and the SIPP that are available on the Census website (U.S. Census Bureau 2019), as well as the monthly CPS cited earlier. The findings using these and other data sources are confirmed in research conducted by numerous nonforensic researchers. For instance, McNeil (2000) used data from the March 2000 ASEC to explore employment rates of persons with a work disability. Also using ASEC data, Yelin (1996), Gibson (2001), and Gibson and Tierney (2000) have shown that employed persons with a work disability, both not severe and severe, are more likely to become unemployed than persons without a work disability. If unemployed, they are less likely to find employment. These differences become more profound with age, making it more difficult to compete with their counterparts without disability and further reducing worklife expectancy.

In work funded by the U.S. Department of Health and Human Services, National Institute on Disability, Independent Living, and Rehabilitation Research, researchers at Cornell and Hunter Universities published multiple papers that explore the reduction in earnings and employment for persons with a disability. Burkhauser, Daly, and Houtenville (2001) and Houtenville (2000) used data from the ASEC. Houtenville (2006), Weathers (2005), and Erickson and Lee (2008) used data from the ACS. Cornell's Employment and Disability Institute maintains online disability statistics using the most current versions of the ACS and ASEC (Disability Statistics 2017). The Rehabilitation Research and Training Center on Disability Statistics and Demographics maintains further data using both these surveys (Houtenville 2013).

Public health researchers have used data from the ACS to study the relationship of ethnic origin and poverty to disability (Fuller-Thomson and Minkler 2005) (Minkler, Fuller-Thomson and Guralnik 2006) (Fuller-Thomson and Gadalla 2008). Using ACS data, researchers from the Kessler Foundation identified individuals with disabilities that have achieved success in the workplace. Their efforts at identifying the disability employment gap can inform efforts to develop

policies and practices that will narrow the persistent gap in employment between people with and without disabilities (Sevak, et al. 2015). The pay gap existing for persons with disabilities is also demonstrated by the American Institutes for Research, using ACS to demonstrate not only the pay gap, but also the increase in gross domestic product (GDP) that would be achieved if people with disabilities were paid comparably as those without (Yin, Shaewitz and Megra December 2014).

Other research includes a study by McCollister and Pflaum (n.d.) that uses the NHIS to study the effects of back pain on worklife expectancy and earnings, and another by DeLeire (2000) that uses the SIPP to address the continuing negative effects of disability following the passage of the Americans with Disabilities Act. Preceding the DeLeire article, a paper presented at the American Law and Economics annual meeting in 1996 cited the probable negative effect of the ADA on employment for persons with a work disability (Gamboa, Gibson and Tierney 1996). In fact, all known research on the subject shows that disability negatively impacts earnings and employment rates.

Defining Earning Capacity

In order to perform a VEA, it is necessary to first understand the concept of earning capacity. Surprisingly little has been written in the forensic vocational or forensic economic literature on the topic of earning capacity. Horner and Slesnick (1999) discuss the concept and the need for a dialogue on the topic. In assessing earning capacity, they discuss the concepts of actual earnings, expected earnings, and earning capacity. These three concepts provide a framework for determining a loss of earning capacity in personal injury litigation. In response to their article, Tierney and Missun (2001, 3) define earning capacity from the perspective of a process model. They indicate, “It differs from traditional models by forsaking the essentialist categories of actual earnings, expected earnings, and earning capacity as commonly defined . . . It focuses on the process applied in assessing lost (future) earnings from which the earning capacity of a particular individual can emerge.” Field (2008) provides a historical analysis of future earnings from the perspective of a five-fold venue, one of which is earning capacity.

Earning capacity is a term used by the courts to identify one component of monetary damages associated with a permanent impairment resulting in disability. Earning capacity differs from wage loss. Wage loss is retrospective, while earning capacity is prospective. Wage loss occurs when an employed individual is unable to continue employment in his or her occupation. It is typically a temporary condition.

An employed individual who sustains a back injury resulting in surgery will experience a period of recuperation during which time actual wages may not be realized. Upon returning to work, a future loss of earning capacity may or may not be probable. If the back injury is a result of a tort or wrong, the tortfeasor is responsible for compensating the individual for past wage loss. If a permanent impairment exists that limits the individual in terms of his or her ability to work, a future loss of earning capacity is probable.

Estimating earning capacity over a lifespan requires an analysis that is both vocational and economic in nature. The VEA is a five-step process. It requires a definition of each of the following: pre-injury earning capacity, pre-injury worklife expectancy, post-injury earning capacity, post-injury worklife expectancy, and a present value calculation.

The first decision point in a VEA requires the expert to define the base dollar figures that reasonably represent pre- and post-injury annual earning capacities. If the individual being assessed has a permanent, medically determinable cognitive or physical impairment, the expert considers the functional limitations associated with that impairment. If it is further determined that the person meets the definition of disability, other factors specific to the individual are then considered. These may include age, education, work history, earning history, general learning ability, transferable skills, present employment status, and labor market access.

Earning capacity represents an individual's ability or power to earn money. It is the sum total of what one brings to the marketplace intellectually and physically. Education, skills, general learning ability, and the like comprise intellectual capacity. Ability to perform the physical activities associated with various jobs constitutes physical aptitude. These physical and intellectual attributes comprise human capital, and it is this human capital that enables a person to produce cash flows over a worklife.

Thus, if a person sustains a closed head injury that limits the ability to focus on a task, remember details, or relate to others, that person may sustain an impairment of mental ability. If, on the other hand, the person sustains a permanent injury limiting the ability to lift, climb, balance, stand, sit, etc., then physical ability is reduced. What remains to be determined in a case of permanent impairment is whether or not the injury in question has reduced or destroyed earning capacity. If so, that individual's earning capacity absent disability requires assessment and comparison with the earning capacity with disability.

Human Capital

The legal system uses a variety of terms to identify probable future economic loss associated with a reduction in ability to work and earn money. Terms such as "reduced power to labor and earn money," "reduced ability to earn," "diminution of capacity to work and earn money," "destruction or reduction of power to work and earn money," and "reduced earning potential" are used to describe compensable damages associated with permanent impairment resulting in disability.

The courts generally acknowledge that something other than wage loss must be compensated for if the individual is likely to have a future earning reduction. If the courts ignored potential to earn and focused on wage loss alone, infants, children, or young adults with a nonexistent or limited earning history would be unable to recover monies likely to be lost as a result of a work disabling condition.

The language used by the court is synonymous with what economists call human capital. Capital is anything that produces wealth. It can be $100,000 invested in a certificate of deposit earning five percent per year or the same amount of money invested in ten, $10,000 lawn mowers. Each represents a form of capital, with the mowers requiring workers before a return on the investment is realized after expenses associated with labor and equipment are considered.

Human capital is defined by economists as the acquisition of knowledge, skill, and understanding as a result of education, training, and experience that allows an individual to sell his or her services in the marketplace in exchange for wages and fringe benefits (Press 2019). The predictors of human capital are two-fold: intelligence and physical ability. These precursors were first

introduced and defined by Gamboa in Thomson West (2006) and serve as the most fundamental building blocks of human capital. Each of the twelve-thousand plus occupational titles contained in the *Dictionary of Occupational Titles* (DOT) are identified as having one of five different levels of general learning ability or intelligence in order for the specific occupation to be performed satisfactorily by a worker (National Academy of Sciences, Committee on Occupational Classification and Analysis 1981). While these definitions are subjective estimates made by employees of the U.S. Department of Labor, they serve as a superb estimate of probable level of intellectual capacity needed for the thousands of occupations identified in the DOT.

There is a strong positive correlation between the variables intelligence, education, skill level, and earnings. Herrnstein and Murray (1994) do an excellent job of examining the relationship among these variables and earnings. Similarly, Gladwell (2008) notes that the higher the IQ score, "the more education you'll get, the more money you're likely to make, and – believe it or not – the longer you'll live." Gamboa and Gibson (2006) note that these same variables increase both earnings and worklife expectancy, and (Gibson 2015) quantifies lifetime earnings by education, age, gender, and disability status. The length of employment over the life expectancy adds significantly to lifetime earnings. Gibson and Gibson (2017) demonstrate the interaction of age (experience), education, gender and disability status for projecting future earnings progression.

Intelligence and physical ability, the precursors to human capital, are used to define earning capacity loss in cases involving infants or children too young to be tested. Absent testing, parental level of educational attainment can be used as an estimate of the infant or child's capacity to complete formal education. There is a positive correlation between intelligence and level of educational attainment. Another approach involves IQ testing by a psychologist familiar with the statistical techniques used to account for regression toward the mean. By IQ testing of each biological parent, a specific IQ score can be used for an infant or child. However, either the education approach or the IQ testing approach is acceptable as an estimate of infant or child level of general learning ability.

Occupations require varying degrees of physical capability. Some occupations require physically strenuous activity while others require little to no physical exertion. The U.S. Department of Labor identifies a myriad of physical demands associated with the occupational titles contained in the DOT. Generally speaking, the occupations range from sedentary to very heavy and include a variety of exertional activities such as climbing, bending, reaching, prolonged standing, etc.

The development of human capital relies upon the two fundamental building blocks, intelligence and physical ability. Reduction or diminution of either of these two components of human capital is synonymous with a decrease in investment capital. A decrease in capital decreases the return on investment (ROI) whether it be human capital or investment capital. If the $100,000 CD is reduced to $20,000, the ROI at five percent is reduced to $1,000. If an individual, as a result of brain injury, sustains a diminution of cognitive functioning resulting in a decrease from significantly above average to average, a significant decrease in the human capital and ROI is realized. Similarly, data from the ACS reveal that college educated workers with physical limitations resulting in problems associated with lifting, carrying, climbing, etc. realize a significant reduction in earnings when compared to nondisabled counterparts who are without disability (U.S. Census Bureau 2017). Information from the National Longitudinal Transition Study-2 (NLTS-2) also confirms this impact for high school graduates (Newman, et al. 2011).

Assessing Earning Capacity

In litigation, the issue is whether or not a permanent injury will affect an individual's ability to work and earn money over a lifetime. Earning capacity is the usual standard for defining lost earnings. Earning capacity is sometimes defined as the "high end" of what a person can earn, in terms of both the annual salary and the number of years worked over a lifetime. The courts, however, usually do not accept damage arguments that would push the concept of earning capacity beyond the bounds of common sense. Our approach in assessing earning capacity is to look at the individual's reasonably expected earnings.

The process of analyzing a case involves answering a series of questions, with each question having several options. Through the process of answering these questions, an individual's earning capacity will emerge. In assessing an individual's annual earning capacity, the choices are to use either actual earnings or a proxy. In most instances, a mature worker has actual earnings that are congruent with future lifetime earning capacity. In cases where historical earnings are used to measure future earning capacity, an individual's historical earnings must be restated to present day dollars for proper comparison. Important sources of information are available from the U.S. Bureau of Labor Statistics:

- Consumer Price Index, All Urban Consumers (CPI-U) (2018)
- Major Sector Productivity and Costs Index: Business Sector, Hourly Compensation (2018)
- National Employment, Hours, and Earnings: Average Hourly Earnings of Production Workers (2018)

However, younger workers rarely have earnings that reasonably represent an average lifetime earning capacity. Vocational theorists note that individuals typically go through a series of stages before settling into a career. Young children and adolescents experience a fantasy stage (the young child desires to be a policeman, trapeze artist, etc.). In late adolescence and early adulthood, an individual experiences a period of exploration at which time a variety of career options are explored, assessed, and evaluated (college students changing majors exemplify the exploration process). As the worker matures, he or she tends to become established in a career. One then proceeds through a period of maintenance and, finally, decline (Ginzberg, et al. 1951) (Super 1957).

This vocational process of career development is conceptually related to the economic concept of the Age-Earnings Cycle. There is obviously a high correlation between age and earnings in that earnings tend to increase as the worker ages because experience enhances productivity, and more productive workers earn a premium in the labor market. It should be noted that the ability to be productive is based on the acquisitions of skill, the intellectual and physical aptitudes that one brings to the marketplace, and, of course, the level of educational attainment achieved by the worker. Gibson and Gibson (2017) uses ACS to present age-specific earnings by gender, level of education, and disability status.

Proxy earnings may be specific to the worker's education level, occupation, or to the labor market, as well as to the worker's gender, disability, and/or age. Proxy earnings can be found in the Occupational Employment Statistics from the U.S. Bureau of Labor Statistics (2018). Data from the ACS (U.S. Census Bureau 2017) and ASEC (1998 forward) surveys can also be used to

calculate average earnings of individuals by gender, level of educational attainment, and by disability status.

Beginning with the 2005 ACS, national average earnings can be calculated by occupational grouping, and state and local averages can be calculated by gender, education level, and disability status. Further refined by the ACS, occupation earnings can be delineated by education. Gibson refined and updated the inaugural presentation given at the ACS Data Users Conference (2014) to demonstrate additional measures of earning capacity for individuals. The data demonstrates that expected earnings tend to increase with education even within specific occupations (Gibson 2018).

Earning capacity is more commonly reduced, rather than destroyed, as a function of a disability. The post-injury earning capacity of a person with a disability is frequently represented by a proxy. The earning capacity associated with the proxy is often greater than the actual earnings of the individual with a disability. Many persons who are recently disabled have not yet begun employment or, if working, are earning at levels less than the amount that would reasonably represent their average lifetime earning capacity, stated in terms of present value.

Older workers with limited education who have performed heavy physical labor and who are disabled are more likely than younger workers to experience a complete destruction of earning capacity as a result of disability. A younger worker with a similar occupational history and a comparable disability would be relatively more likely to experience a reduction of lifetime earning capacity. Total destruction of earning capacity typically occurs among older workers who are no longer capable of performing their usual and customary work or those who are severely or catastrophically impaired, regardless of age.

Once the expert establishes annual earning capacity, appropriate fringe benefit and worklife expectancy values are applied to project lifetime earnings. Either actual fringe benefits or a statistical average is used. Statistical averages for fringe benefits may often be derived from the U.S. Bureau of Labor Statistics' *Employer Costs for Employee Compensation* (2018). Another source for health care coverage emanates from the Kaiser Family Foundation's health insurance survey (2018).

Worklife Expectancy

The second decision point in a VEA requires the expert to define pre- and post-injury worklife expectancies, or the number of years of future employment. Worklife can be thought of on an *assumed* or a *statistical* basis. Lay persons typically think of worklife as an assumed statistic, where they project the number of years to an expected retirement age (e.g., Social Security retirement at 67). However, through use of statistics, economists typically adjust for the probability that a person will not work at earlier ages (e.g., lay-offs, early retirement) or will work past typical retirement ages.

Defining Worklife Expectancy

Through typical economic measurement, worklife expectancy is a statistical average, derived by summing a series of joint probabilities of life, participation, and employment (LPE) from a given age through age 89. The notion of worklife expectancy is not unique to the forensic setting, as

evidenced by the various articles by Millimet et al., referencing ASEC data (Millimet, Nieswiadomy and Slottje 2010) (Millimet, Nieswiadomy and Ryu, et al. 2003). The worklife methodology used in VEAs was introduced as the LPE method by Brookshire and Cobb (1983) and refined by Brookshire, Cobb, and Gamboa (1987) to include persons with a work disability. With this methodology, a person's earning capacity is reduced by the probability of being alive and employed.

This methodology can be applied using data from various surveys in order to calculate disability-related worklife expectancy. Using ASEC data, worklife expectancy tables for persons with a work disability were first published by Gamboa (1987) and updated periodically. The latest edition includes worklife expectancy statistics for persons with a work disability as well as for those with a physical or cognitive disability (Gamboa and Gibson Revised 2015).

The notion of discounting an individual's future earning capacity by the probability of being alive and employed first appeared in an appellate court decision entitled O'Shea v. Riverway Towing (1982, 1194) written by Richard A. Posner. In commenting on the plaintiff's before injury expected earnings, he notes:

> If the probability of her being employed as a boat's cook full time in 1990 was only 75 percent, for example, then her estimated wages in that year should have been multiplied by .75 to determine the value of the expectation that she lost as a result of the accident; and so with each of the other future years.

In terms of assessing after injury expected earnings, he describes the following:

> Here is a middle-aged woman, very overweight, badly scarred on one arm and one leg, unsteady on her feet, in constant and serious pain from the accident, with no education beyond high school and no work skills other than cooking, a job that happens to require standing for long periods which she is incapable of doing. It seems unlikely that someone in this condition could find gainful work at the minimum wage. True, the probability is not zero; and a better procedure, therefore, might have been to subtract from Mrs. O'Shea's lost future wages as a boat's cook the wages in some other job, discounted (i.e., multiplied) by the probability-very low-that she would in fact be able to get another job. But the district judge cannot be criticized for having failed to use a procedure not suggested by either party. The question put to him was the dichotomous one, would she or would she not get another job if she made reasonable efforts to do so? This required him to decide whether there was a more than 50 percent probability that she would. We cannot say that the negative answer he gave to that question was clearly erroneous.

The opinion reflects a "better procedure" for estimating future expected earnings – that of utilizing probability statistics to better define future expected earnings in assisting the trier of fact. The O'Shea case involves a woman with a severe work disability. The probability of employment for a 57-year-old female high school graduate with a severe work or physical disability is .044 or .116, respectively, compared to a probability of employment of .654 or .673 for a female of the same age and education with no disability (Gamboa and Gibson Revised 2015).

Assessing Worklife Expectancy

Because worklife expectancy is a statistical average, exercising professional judgment is essential when defining probable worklife expectancy in years. Worklife expectancy is specific to gender, career pattern, education, age, and disability.

When assessing worklife expectancy, it is important to consider the individual's work history. Typically, males have worklife expectancies that are greater than females. However, a specific female may demonstrate a work pattern that is more like that of an average male of the same age and level of education than that of a female. Corcione and Thornton (1991) demonstrated similar worklife expectancies for males and career-driven females. Richards and Donaldson (2010, 69) note that forensic economists frequently adjust for the worklife of a career-driven female by using male worklife expectancies. A recent article in the Journal of Economic Perspectives highlights increased labor force participation rates for women using data from the ASEC as well as the SIPP (Goldin and Mitchell 2017). Similarly, some males may exhibit a pattern of work that is unlike that of an average male with a similar age, education level, and disability status. The specifics of each individual must be considered when assigning worklife expectancy.

Defining worklife expectancy for an individual also requires examination of personal and economic incentives of work. Individuals who are members of labor unions, for example, may have economic incentives in the form of pension receipts to maintain work until a specific age. Older workers with younger children may have economic incentive to maintain employment and support further educational attainment. Individuals with demonstrated employment higher than their statistical cohort may be expected to continue. Using rates of continuous employment may be appropriate in all or any of the above examples.

The population with disabilities varies significantly in terms of severity of disability, which in turn influences access to various occupations in the labor market. This variance is taken into account with worklife expectancy averages for persons with disabilities. When using data specific to people with work disabilities, for instance, these averages are of three types: the average for all persons with work disabilities, the average for persons with severe work disabilities, and the average for persons whose work disabilities are not severe. Individuals who meet the definition of work disability and who are employed or who have access to a significant portion of jobs in the labor market may be considered not severely disabled. Individuals who are highly unlikely to find or maintain employment are likely to be totally disabled or to meet the definition of severe work disability.

With data from the American Community Survey, averages can be looked at by type of disability, such as physical or cognitive, which would be appropriate for those persons meeting the definitions noted previously. Through isolation or combination of these varying disability types, an analysis can be customized to meet the specifics of a particular case.

Employment statistics offer average for groups of individuals. Just as a nondisabled worker may have employment experiences that exceed the average for their statistical cohort, a person meeting the definition of disability may have employment experiences that exceed the average. An expert may choose to identify the individual as having a higher (or lower) than average level of expected employment probabilities through the use of a continuum placement.

Similarly, an expert may determine that for a particular plaintiff, an assumed worklife is superior to use of statistical averages. For example, assume the plaintiff has 25 years of continuous employment in a given position, and full retirement is available through his pension in another five years. Under this scenario, the plaintiff has continually defied statistics for the last 25 years, and the expert may reasonably use his full retirement age to project the number of years worked had the intervening incident not occurred.

The ACS defines disability from both a physical and cognitive perspective. In addition, it identifies persons with problems associated with self-care and/or going outside of the home alone. When either of these two additional limitations exist, a severe physical or cognitive disability is likely to exist.

Present Value of Future Lost Earnings

The last decision point in a VEA is the statement of future loss of earnings in terms of present value. Present value in a litigation context specific to loss of earning capacity refers to the amount of money needed today which, when prudently invested, will replace a future stream of lost earnings. The present value sum plus accumulated interest should provide periodic cash payments to replace the expected lost earnings over the plaintiff's worklife expectancy, with no shortfall or overage.

The calculation of present value considers two facts. The first fact is earnings tend to increase over time. For example, the average teacher in 2016 is likely to earn less than the average teacher in 2026. As a result, present value of future lost earnings must consider the fact that earnings are likely to increase over the time period that losses are projected. The annual rate of increase is often referred to as the growth rate.

The second fact concerns a financial consideration. If an amount of money is invested today for future lost earnings, interest can be earned from investing this money before the loss occurs. For instance, money in-hand today to compensate for loss of earnings as a teacher in 2026 should also consider interest that can be earned from investing this money until 2026. The interest rate used to reduce loss of future value earnings to present value is often referred to as the discount rate.

Growth and discount rates can either be stated as "nominal" or "real" rates. Nominal rates include inflation while real rates are net of inflation. For example, suppose in a particular year the general rate of inflation as measured by the Consumer Price Index (CPI) is 3%, and an investment yields a 5% rate of interest. The nominal rate of interest is 5%. However, there would only be a 2% gain in terms of the real purchasing power of the money earned because inflation has also risen at 3%. The real rate of interest in this example would be 2%. Likewise, a person with a 5% increase in earnings in a year when the general rate of inflation was 3% would have a 5% nominal and 2% real growth in earnings. Present value calculations can either be performed with real or nominal rates. Both approaches are acceptable for computing the present value of a future stream of lost earnings.

Growth Rate for Compensation

Before selecting a growth rate, one must consider precisely what is being grown. There are a number of fairly common misunderstandings in this regard that deserve mention. For example, some attorneys refer to the growth rate as "inflation." The word inflation in the field of economics typically refers to an increase in consumer prices, as measured by the CPI. The rate of increase in the CPI may not be the same as the rate of growth in earnings since consumer prices and a worker's earnings are different variables.

Another common misunderstanding is the belief that the growth rate is the rate of increase in wages. Since a "lost earnings" analysis considers both base wage and fringe benefits, the growth rate should consider both components. Fringe benefits such as health coverage and retirement have an economic value, which is part of what a person earns in exchange for their employment. A person may have an economic incentive to accept a lower paying job because it offers better benefits. In other instances, a person may have an economic incentive to accept a job with no benefits, other than those that are legally mandated, if they are compensated with relatively high wages. For these reasons, total compensation (wages plus benefits) is generally the appropriate variable to examine when discussing what is often referred to as growth in earnings.

Figure 4 on shows historical rates of growth for inflation, wages, and total compensation, all from the U.S. Bureau of Labor Statistics. The data summarized in Figure 4 show that the rate of growth in total compensation has consistently outpaced both inflation and wage growth for short-term as well as long-term time periods. Thus, any analysis of lost earnings conducted during those periods that used a growth rate measured by wages only, would have underestimated the actual growth.

Having decided to examine compensation data, instead of inflation or wage data, the next step towards choosing a growth rate is a selection of historical time period(s) that should be considered for the assessment. Averages for different time periods will obviously result in different average nominal and real rates of growth for compensation.

Future projections are made with uncertainty to the future state of the economy. For example, no one could say with great certainty whether or not inflation will be relatively high or low ten years from now, whether or not our economy will be in a recession at that time, etc. For these reasons, a reasonable and fair estimate of the future rate of growth in total compensation should generally be based on long-term data for average growth in total compensation. Long-term averages cover many years, including years of recession and strong economic growth as well as years with high and low levels of inflation. The same time periods examined for compensation growth should be reviewed for interest rates used to discount an award to present value, as discussed in the following section. Therefore, the selection of historical time period(s) to consider for future compensation growth must also be appropriate for choosing a fair and reasonable discount rate.

Interest or Discount Rate

The next step in computing present value is to reduce the future cash flow values for interest the plaintiff can earn by investing a lump-sum award. That is, we must reduce the future value of projected cash flows for the interest the plaintiff can earn since the damages award is in advance

of the anticipated occurrence. Choice of the rate used to measure interest is critical since the higher the assumed interest rate, the larger the reduction and the lower the needed lump-sum award.

Finance theory refers to this process as *discounting* and the rate applied as the *discount rate*. Further, such theory recognizes that discount rates are comprised of expected inflation, a real rate of return, and a risk premium. Whether valuing business income, a potential investment, or future wages, theory requires that the rate used reflect the overall riskiness of the measured cash flow. Valuation of lost future compensation is not measurement of a speculative investment, but the replacement of the bread and butter the plaintiff is putting on the family table. As such, the risk premium component should be valued at zero.

This is similar to the approach proposed by Brody over thirty years ago (Brody 1982). Further, this approach is consistent with that prescribed by the U.S. Supreme Court (Jones and Laughlin Steel Corporation v. Howard E. Pfeifer 1983), in which they dictate use of the "best and safest investments" and a "risk-free stream of earnings."

With the intent of applying a risk-free discount rate, we must determine the best instrument to measure this rate. Risk of debtor default brings increases in interest rates to compensate the creditor for the risk assumed. Thus, the instrument used should bear no such risk. Experts agree that the closest instruments to being free of such risk are the bonds and bills issued by the United States Treasury. However, our search for a risk-free rate does not stop with identification of the issuer of the instrument. The Treasury offers many forms and durations of debt instruments. Consider two extremes presented in Figure 4 debt instruments with 91-day and 10-year maturities. As shown, longer-term commitments regularly command higher interest rates, despite the fact that both bear the same risk of default, considered to be zero. Investors command a premium to compensate for the long-term commitment and the inherent risks associated with it, including the risk of inflation.

Figure 4 Key Growth and Interest Rates[10]

Period	Inflation	Wage Growth	Compen. Growth	91-Day	10-Year[11]
60 years (1958-2018)	3.7%	4.1%	4.9%	4.6%	N/A
50 years (1968-2018)	4.0%	4.1%	4.9%	4.8%	6.4%
40 years (1978-2018)	3.4%	3.4%	4.2%	4.5%	6.2%
30 years (1988-2018)	2.5%	3.0%	3.4%	3.0%	4.7%
20 years (1998-2018)	2.2%	2.8%	3.2%	1.8%	3.6%
10 years (2008-2018)	1.6%	2.3%	2.2%	0.4%	2.5%
5 years (2012-2018)	1.5%	2.4%	2.4%	0.6%	2.4%

The risk of inflation arises because interest rates and note values change with inflation. As shown in Figure 4, interest rates rise and fall with inflation. If an investor buys a 10-year note in a period of low inflation, a rise in inflation will decrease the value of the investment and the real rate of return. As noted by Pelaez (1995, 54), discounting lost earnings by a long-term rate is asking the plaintiff "to accept risk in order to reduce the tortfeasor's liability."

In addition, multi-year Treasury instruments can carry a tax disadvantage for the buyer. Some Treasury instruments pay no interest until maturity. However, an imputed annual interest amount[12] is required to be realized as taxable income, resulting in annual tax payments before receipt of any cash flow from the investment. Standard long-term Treasury notes do pay interest every six months. However, even these may have a hidden tax disadvantage, since adjustment of a bond's face rate to the rate commanded by financial markets is achieved by paying more or less than the face value of the bond or through an "Original Issue Discount." This difference is also amortized over the life of the bond and realized as an adjustment to interest earned. Thus, in cases where the market rate exceeds the face rate, the buyer will pay less than the face value of the bond and pay taxes on the annual amortization even though the actual cash will not be received until the bond's maturity.

As a preferred alternative, short-term rates such as the 91-day Treasury Bill[13] provide the same protection against the risk of default. Moreover, they provide the added protection against inflation risk by cycling maturities to meet needed cash flows and avoid the tax disadvantages of long-term

[10] Rates shown are the geometric averages for the identified periods of time using data from the following sources:
- U.S. Bureau of Labor Statistics - Inflation (Consumer Price Index, All Urban Consumers (CPI-U), U.S. City Average 2018) , Wage Growth (National Employment, Hours, and Earnings: Average Hourly Earnings of Production Workers 2018) , and Compensation Growth (Major Sector Productivity and Costs Index: Business Sector, Hourly Compensation 2018)
- Federal Reserve Bank – 91-day Treasury Bill (3-Month Treasury Bill Secondary Market Rate Discount Basis 2018) and 10-year Treasury Note (Market Yield on US Treasury Securities at 10-year Constant Maturity Quoted on Investment Basis 2018).

[11] 10-year Treasury Bonds did not exist until 1962.

[12] This imputed interest is known as *accretion*.

[13] We note that the U.S. Treasury also offers instruments of even shorter duration: 4-week Treasury Bills. These instruments have only been available since 2001, so they do not have a long-term measurable trend. However, in their tenure, they generally have a rate of return comparable to 91-day Treasury Bills.

bonds. Choice of a 91-day Treasury as a measure of the risk-free discount rate is supported in financial literature and in forensic economic articles such as Pelaez (1989), Lawlis and Male (1994), and Altmann (2002).

Some alternatives occasionally proposed by other experts include the following:

- **Long-term Treasury Notes or Bonds** – As discussed above, these instruments all provide greater risk from inflation and may present tax disadvantages.
- **Treasury Inflation-Protected Securities (TIPS)** – Issued by the United States Treasury, TIPS bonds have an appeal of offering an instrument with no risk of default that is also protected against inflation. However, the market for these relatively new instruments is still imperfect as noted in many articles including Shen and Corning (2001) and Kopcke and Kimball (1999). This has even resulted in negative inflation-adjusted yields (Gongloff 2008).
- **Municipal Bonds** – High-grade debt instruments may provide less risk than the corporate bond market. However, as demonstrated in past financial crises and likely in the current economic environment, they are far from the level of protection offered by U.S. Treasury instruments.
- **Stock Market** – Although some may proffer discount rates derived from general stock market returns, in no event can these be considered to meet the requirements of risk-free rates, regardless of the stature of the companies included. This is certainly demonstrated by the market performance in the economic crisis that began in 2008.

Thus, in our opinion, at the time of this writing, the nature of claims and known court guidelines mandate use of a risk-free discount rate when valuing lost earnings. The best measure of this rate is offered by a 91-day Treasury bill.

Present Value Calculation

There are two important variables to be considered in arriving at the present value of a future loss of earning capacity. The first is the growth factor to be used. The second is the discount factor. If the growth factor is greater than the discount factor, a net negative discount results. If a pure offset, also referred to as a net neutral discount, is used to arrive at present value, the growth factor is equal to the discount factor, resulting in a present value sum less than the value achieved if a net negative discount is used. A third approach to arriving at present value is referred to as a net positive discount. The discount factor is assumed to be greater than the growth factor, resulting in a present value sum less than the value achieved if a net neutral discount is used.

The standard methodology employed in arriving at a present value calculation embraces the following formula:

$$PV = \sum CF\left(\frac{1+G}{1+D}\right)^{n}$$

PV = Present Value

$\sum$ CF = Summation of the cash flows
G = Growth rate for compensation
D = Discount rate of interest rate
n = years of compounding and discounting

All present value calculations utilize the same methodology. Different present value sums are derived as a function of the growth and discount factor used. When a pure offset is used, the growth and discount factors are set as equal to one another. The effect neutralizes the future cash flows resulting in a net neutral discount. Therefore, the summation of each of the future cash flows stated in terms of today's dollars becomes the present value.

Economic literature provides substantial support for a total offset to value lost earnings. Altmann (2002) reviews historical cycles and notes that any disturbance between equilibrium of growth and discount rates tends to be temporary due to "powerful economic forces" that cause the net discount rate to regress to 0%. Lawlis and Male (1994) found a random walk relationship between growth and interest and held that a total offset is the least potentially biased net discount rate.

Brody (1982) observed that with risk held to 0%, the only factors to consider are productivity gains (growth) and the real interest rate. He held that a total offset had been the most accurate net discount rate in the preceding twenty years.

Carlson (1976) noted that when inflation is fully anticipated by the financial and labor markets, wage increases and bond yields were essentially equal. He held that use of a total offset was not only accurate but eliminated much of the confusion generated in courtrooms debating the appropriate rates, classifying such debate as "just plain silly and unnecessary."

Pelaez (1989) found a total offset to be a "robust alternative to the pursuit of illusory exactness based on time consuming calculations and dubious prognostications." In a subsequent article, Pelaez (1995) affirmed the total offset's superiority when considering real interest and growth rates.

Schwartz and Thornton (1991) affirmed much of the above observations. Schwartz (1997) updated his opinions, noting the fallacy of trying to measure movements of earnings and interest rates on short-term trends. He held "over the longer run, the relation between the basic real interest rate and the productivity growth rate does seem to approach equality." Schwartz (2000) affirmed his findings yet again a few years later, noting that use of a total offset is not only fair, but efficient because of its ability to reduce many complications and costs of litigation.

More recently, Stern (2005) confronted the myths associated with "discounting to present value." He provides examples of why it is not necessary to reduce a future earnings loss below the value of today's dollars.

Summary

The attached VEA conforms to the principles identified in this VER. The lifetime loss of earning capacity is derived through a five-step model involving a definition of pre-injury earning capacity,

pre-injury worklife expectancy, post-injury earning capacity, post-injury worklife expectancy, and a present value calculation. Each step in the assessment pertaining to lifetime earning potential is geared to the unique traits and characteristics of the individual. The present value of the lost earnings is an estimate of the measurable economic damages sustained by the individual.

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WORKLIFE EXPECTANCY

AMERICAN COMMUNITY SURVEY

A worklife expectancy statistically estimates how long a person will work over a lifetime. Predictors of worklife are age, level of educational attainment, gender, and disability status. The likelihood of work is calculated from a specific age through the end of the analysis. Each statistical interval in the worklife pattern represents the joint probability that an individual is alive, in the labor force, and actually employed. The statistical intervals are then summed thereby determining the worklife expectancy in years, the format in which worklife expectancies are typically presented.

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Worklife Probability

C.B.

High School

	Preinjury HS
Birth Year	2016
Injury Date	9/24/2016
Analysis Date	11/25/2019
Avg. Base Wage	42,700
Fringe Rates	25.6%
Education Level	High School Graduate
Gender Life/Emp.	Male
Disab. Status	Not Disabled
Growth/Discount	Pure Offset
Total Worklife	38.0
Total Earnings	2,039,723

			Preinjury HS				
Mo/Yr	Age	Years	Prob. Life	Prob. Empl.	Prob. Work	Base Earning	Adjusted Earnings
6/2035	18.68	0.32	0.995	0.522	0.166	20,000	4,170
9/2035	19.00	1.00	0.994	0.522	0.519	21,674	14,129
9/2036	20.00	1.00	0.993	0.743	0.738	23,416	21,705
9/2037	21.00	1.00	0.992	0.743	0.737	24,977	23,121
9/2038	22.00	1.00	0.991	0.743	0.736	26,227	24,245
9/2039	23.00	1.00	0.989	0.743	0.735	27,516	25,402
9/2040	24.00	1.00	0.988	0.743	0.734	29,271	26,985
9/2041	25.00	1.00	0.986	0.838	0.826	31,260	32,431
9/2042	26.00	1.00	0.984	0.838	0.825	32,750	33,936
9/2043	27.00	1.00	0.983	0.838	0.824	33,619	34,794
9/2044	28.00	1.00	0.981	0.838	0.822	34,420	35,536
9/2045	29.00	1.00	0.979	0.838	0.820	35,465	36,526
9/2046	30.00	1.00	0.977	0.866	0.846	36,660	38,954
9/2047	31.00	1.00	0.976	0.866	0.845	37,805	40,123
9/2048	32.00	1.00	0.974	0.866	0.843	38,645	40,918
9/2049	33.00	1.00	0.972	0.866	0.842	39,230	41,488
9/2050	34.00	1.00	0.970	0.866	0.840	40,070	42,275
9/2051	35.00	1.00	0.968	0.877	0.849	41,385	44,131
9/2052	36.00	1.00	0.965	0.877	0.846	42,742	45,417
9/2053	37.00	1.00	0.963	0.877	0.845	43,732	46,414
9/2054	38.00	1.00	0.961	0.877	0.843	44,367	46,976
9/2055	39.00	1.00	0.959	0.877	0.841	44,787	47,308
9/2056	40.00	1.00	0.956	0.885	0.846	45,105	47,927
9/2057	41.00	1.00	0.954	0.885	0.844	45,389	48,115
9/2058	42.00	1.00	0.951	0.885	0.842	45,705	48,335
9/2059	43.00	1.00	0.949	0.885	0.840	46,225	48,769
9/2060	44.00	1.00	0.946	0.885	0.837	46,969	49,377
9/2061	45.00	1.00	0.943	0.880	0.830	47,688	49,714
9/2062	46.00	1.00	0.939	0.880	0.826	48,293	50,102
9/2063	47.00	1.00	0.936	0.880	0.824	48,941	50,651
9/2064	48.00	1.00	0.932	0.880	0.820	49,547	51,029
9/2065	49.00	1.00	0.928	0.880	0.817	49,930	51,236
9/2066	50.00	1.00	0.923	0.863	0.797	50,320	50,372
9/2067	51.00	1.00	0.918	0.863	0.792	50,891	50,624
9/2068	52.00	1.00	0.912	0.863	0.787	51,359	50,767
9/2069	53.00	1.00	0.906	0.863	0.782	51,578	50,659

				Preinjury HS			
Mo/Yr	Age	Years	Prob. Life	Prob. Empl.	Prob. Work	Base Earning	Adjusted Earnings
9/2070	54.00	1.00	0.900	0.863	0.777	51,734	50,488
9/2071	55.00	1.00	0.893	0.813	0.726	51,924	47,347
9/2072	56.00	1.00	0.885	0.813	0.720	52,061	47,080
9/2073	57.00	1.00	0.877	0.813	0.713	52,109	46,665
9/2074	58.00	1.00	0.869	0.813	0.706	52,086	46,187
9/2075	59.00	1.00	0.859	0.813	0.698	51,854	45,460
9/2076	60.00	1.00	0.850	0.646	0.549	51,318	35,386
9/2077	61.00	1.00	0.839	0.646	0.542	50,727	34,533
9/2078	62.00	1.00	0.828	0.646	0.535	50,312	33,808
9/2079	63.00	1.00	0.816	0.646	0.527	50,111	33,169
9/2080	64.00	1.00	0.804	0.646	0.519	49,928	32,546
9/2081	65.00	1.00	0.791	0.338	0.267	49,320	16,540
9/2082	66.00	1.00	0.778	0.338	0.263	47,861	15,810
9/2083	67.00	1.00	0.764	0.338	0.258	45,213	14,651
9/2084	68.00	1.00	0.749	0.338	0.253	41,594	13,217
9/2085	69.00	1.00	0.733	0.338	0.248	41,594	12,956
9/2086	70.00	1.00	0.717	0.201	0.144	41,594	7,523
9/2087	71.00	1.00	0.699	0.201	0.140	41,594	7,314
9/2088	72.00	1.00	0.680	0.201	0.137	41,594	7,157
9/2089	73.00	1.00	0.661	0.201	0.133	41,594	6,948
9/2090	74.00	1.00	0.640	0.201	0.129	41,594	6,739
9/2091	75.00	1.00	0.618	0.141	0.087	41,594	4,545
9/2092	76.00	1.00	0.594	0.141	0.084	41,594	4,388
9/2093	77.00	1.00	0.569	0.141	0.080	41,594	4,179
9/2094	78.00	1.00	0.542	0.141	0.076	41,594	3,970
9/2095	79.00	1.00	0.515	0.141	0.073	41,594	3,814
9/2096	80.00	1.00	0.485	0.082	0.040	41,594	2,090
9/2097	81.00	1.00	0.455	0.082	0.037	41,594	1,933
9/2098	82.00	1.00	0.423	0.082	0.035	41,594	1,828
9/2099	83.00	1.00	0.391	0.082	0.032	41,594	1,672
9/2100	84.00	1.00	0.357	0.082	0.029	41,594	1,515
9/2101	85.00	1.00	0.323	0.054	0.017	41,594	888
9/2102	86.00	1.00	0.289	0.054	0.016	41,594	836
9/2103	87.00	1.00	0.254	0.054	0.014	41,594	731
9/2104	88.00	1.00	0.221	0.054	0.012	41,594	627
9/2105	89.00	1.00	0.188	0.054	0.010	41,594	522
Future	**Totals**	**71.32**			**38.032**		**2,039,723**

Citations

Arias, Elizabeth and Jiaquan Xu. National Vital Statistics Reports, vol. 68 no. 7, United States Life Tables, 2017. National Center for Health Statistics, U.S. Center for Disease Control and Prevention, Hyattsville, MD, 2019. https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_07-508.pdf (accessed June 2019).

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Worklife Probability

C.B.

Some College but No Degree

	Preinjury SC
Birth Year	2016
Injury Date	9/24/2016
Analysis Date	11/25/2019
Avg. Base Wage	51,988
Fringe Rates	25.6%
Education Level	Some College, No Degree
Gender Life/Emp.	Male
Disab. Status	Not Disabled
Growth/Discount	Pure Offset
Total Worklife	37.7
Total Earnings	2,462,540

			Preinjury SC				
Mo/Yr	Age	Years	Prob. Life	Prob. Empl.	Prob. Work	Base Earning	Adjusted Earnings
6/2037	20.68	0.32	0.993	0.677	0.215	22,922	6,190
9/2037	21.00	1.00	0.992	0.677	0.672	24,578	20,745
9/2038	22.00	1.00	0.991	0.677	0.671	26,297	22,162
9/2039	23.00	1.00	0.989	0.677	0.670	28,174	23,709
9/2040	24.00	1.00	0.988	0.677	0.669	30,441	25,578
9/2041	25.00	1.00	0.986	0.853	0.841	33,020	34,879
9/2042	26.00	1.00	0.984	0.853	0.839	35,445	37,351
9/2043	27.00	1.00	0.983	0.853	0.838	37,564	39,537
9/2044	28.00	1.00	0.981	0.853	0.837	39,512	41,538
9/2045	29.00	1.00	0.979	0.853	0.835	41,229	43,239
9/2046	30.00	1.00	0.977	0.887	0.867	42,619	46,410
9/2047	31.00	1.00	0.976	0.887	0.866	43,752	47,589
9/2048	32.00	1.00	0.974	0.887	0.864	44,791	48,606
9/2049	33.00	1.00	0.972	0.887	0.862	46,000	49,803
9/2050	34.00	1.00	0.970	0.887	0.860	47,713	51,538
9/2051	35.00	1.00	0.968	0.901	0.872	49,889	54,640
9/2052	36.00	1.00	0.965	0.901	0.869	51,883	56,628
9/2053	37.00	1.00	0.963	0.901	0.868	53,178	57,975
9/2054	38.00	1.00	0.961	0.901	0.866	53,955	58,687
9/2055	39.00	1.00	0.959	0.901	0.864	54,643	59,298
9/2056	40.00	1.00	0.956	0.906	0.866	55,309	60,159
9/2057	41.00	1.00	0.954	0.906	0.864	55,963	60,730
9/2058	42.00	1.00	0.951	0.906	0.862	56,684	61,370
9/2059	43.00	1.00	0.949	0.906	0.860	57,270	61,861
9/2060	44.00	1.00	0.946	0.906	0.857	57,797	62,212
9/2061	45.00	1.00	0.943	0.906	0.854	58,768	63,036
9/2062	46.00	1.00	0.939	0.906	0.851	59,959	64,088
9/2063	47.00	1.00	0.936	0.906	0.848	60,648	64,595
9/2064	48.00	1.00	0.932	0.906	0.844	60,854	64,509
9/2065	49.00	1.00	0.928	0.906	0.841	60,920	64,350
9/2066	50.00	1.00	0.923	0.887	0.819	61,062	62,812
9/2067	51.00	1.00	0.918	0.887	0.814	61,455	62,831
9/2068	52.00	1.00	0.912	0.887	0.809	61,959	62,957
9/2069	53.00	1.00	0.906	0.887	0.804	62,320	62,932
9/2070	54.00	1.00	0.900	0.887	0.798	62,477	62,620
9/2071	55.00	1.00	0.893	0.832	0.743	62,508	58,333

				Preinjury SC			
			Prob.	Prob.	Prob.	Base	Adjusted
Mo/Yr	Age	Years	Life	Empl.	Work	Earning	Earnings
9/2072	56.00	1.00	0.885	0.832	0.736	62,506	57,782
9/2073	57.00	1.00	0.877	0.832	0.730	62,502	57,307
9/2074	58.00	1.00	0.869	0.832	0.723	62,393	56,658
9/2075	59.00	1.00	0.859	0.832	0.715	61,990	55,669
9/2076	60.00	1.00	0.850	0.667	0.567	61,352	43,692
9/2077	61.00	1.00	0.839	0.667	0.560	60,766	42,740
9/2078	62.00	1.00	0.828	0.667	0.552	60,416	41,887
9/2079	63.00	1.00	0.816	0.667	0.544	60,170	41,112
9/2080	64.00	1.00	0.804	0.667	0.536	59,602	40,125
9/2081	65.00	1.00	0.791	0.379	0.300	58,508	22,046
9/2082	66.00	1.00	0.778	0.379	0.295	57,021	21,127
9/2083	67.00	1.00	0.764	0.379	0.290	54,975	20,024
9/2084	68.00	1.00	0.749	0.379	0.284	52,242	18,635
9/2085	69.00	1.00	0.733	0.379	0.278	52,242	18,241
9/2086	70.00	1.00	0.717	0.232	0.166	52,242	10,892
9/2087	71.00	1.00	0.699	0.232	0.162	52,242	10,630
9/2088	72.00	1.00	0.680	0.232	0.158	52,242	10,367
9/2089	73.00	1.00	0.661	0.232	0.153	52,242	10,039
9/2090	74.00	1.00	0.640	0.232	0.148	52,242	9,711
9/2091	75.00	1.00	0.618	0.161	0.099	52,242	6,496
9/2092	76.00	1.00	0.594	0.161	0.096	52,242	6,299
9/2093	77.00	1.00	0.569	0.161	0.092	52,242	6,037
9/2094	78.00	1.00	0.542	0.161	0.087	52,242	5,709
9/2095	79.00	1.00	0.515	0.161	0.083	52,242	5,446
9/2096	80.00	1.00	0.485	0.097	0.047	52,242	3,084
9/2097	81.00	1.00	0.455	0.097	0.044	52,242	2,887
9/2098	82.00	1.00	0.423	0.097	0.041	52,242	2,690
9/2099	83.00	1.00	0.391	0.097	0.038	52,242	2,493
9/2100	84.00	1.00	0.357	0.097	0.035	52,242	2,297
9/2101	85.00	1.00	0.323	0.060	0.019	52,242	1,247
9/2102	86.00	1.00	0.289	0.060	0.017	52,242	1,115
9/2103	87.00	1.00	0.254	0.060	0.015	52,242	984
9/2104	88.00	1.00	0.221	0.060	0.013	52,242	853
9/2105	89.00	1.00	0.188	0.060	0.011	52,242	722
Future	**Totals**	**69.32**			**37.713**		**2,462,540**

Citations

Arias, Elizabeth and Jiaquan Xu. National Vital Statistics Reports, vol. 68 no. 7, United States Life Tables, 2017. National Center for Health Statistics, U.S. Center for Disease Control and Prevention, Hyattsville, MD, 2019. https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_07-508.pdf (accessed June 2019).

U. S. Census Bureau. 2019. "American Community Survey (ACS) PUMS Data. 2014-2018 1-year PUMS files." https://www.census.gov/programs-surveys/acs/data/pums.html (accessed November 2019).

Worklife Probability

C.B.

Associate Degree

	Preinjury AD
Birth Year	2016
Injury Date	9/24/2016
Analysis Date	11/25/2019
Avg. Base Wage	56,480
Fringe Rates	25.6%
Education Level	Associate Degree
Gender Life/Emp.	Male
Disab. Status	Not Disabled
Growth/Discount	Pure Offset
Total Worklife	38.0
Total Earnings	2,694,989

			Preinjury AD				
Mo/Yr	Age	Years	Prob. Life	Prob. Empl.	Prob. Work	Base Earning	Adjusted Earnings
6/2038	21.68	0.32	0.992	0.756	0.240	26,000	7,837
9/2038	22.00	1.00	0.991	0.756	0.749	28,977	27,260
9/2039	23.00	1.00	0.989	0.756	0.748	31,641	29,726
9/2040	24.00	1.00	0.988	0.756	0.747	34,312	32,193
9/2041	25.00	1.00	0.986	0.875	0.863	37,016	40,123
9/2042	26.00	1.00	0.984	0.875	0.861	39,359	42,563
9/2043	27.00	1.00	0.983	0.875	0.860	41,373	44,689
9/2044	28.00	1.00	0.981	0.875	0.858	43,150	46,501
9/2045	29.00	1.00	0.979	0.875	0.857	44,742	48,160
9/2046	30.00	1.00	0.977	0.911	0.890	46,502	51,982
9/2047	31.00	1.00	0.976	0.911	0.889	48,354	53,991
9/2048	32.00	1.00	0.974	0.911	0.887	49,818	55,501
9/2049	33.00	1.00	0.972	0.911	0.885	51,145	56,851
9/2050	34.00	1.00	0.970	0.911	0.884	52,811	58,636
9/2051	35.00	1.00	0.968	0.925	0.895	54,512	61,278
9/2052	36.00	1.00	0.965	0.925	0.893	55,875	62,670
9/2053	37.00	1.00	0.963	0.925	0.891	56,875	63,649
9/2054	38.00	1.00	0.961	0.925	0.889	57,469	64,169
9/2055	39.00	1.00	0.959	0.925	0.887	58,021	64,640
9/2056	40.00	1.00	0.956	0.924	0.883	59,113	65,559
9/2057	41.00	1.00	0.954	0.924	0.881	60,480	66,923
9/2058	42.00	1.00	0.951	0.924	0.879	61,400	67,787
9/2059	43.00	1.00	0.949	0.924	0.877	61,852	68,131
9/2060	44.00	1.00	0.946	0.924	0.874	62,289	68,377
9/2061	45.00	1.00	0.943	0.921	0.869	62,930	68,686
9/2062	46.00	1.00	0.939	0.921	0.865	63,742	69,252
9/2063	47.00	1.00	0.936	0.921	0.862	64,598	69,938
9/2064	48.00	1.00	0.932	0.921	0.858	65,402	70,480
9/2065	49.00	1.00	0.928	0.921	0.855	66,131	71,017
9/2066	50.00	1.00	0.923	0.906	0.836	66,689	70,025
9/2067	51.00	1.00	0.918	0.906	0.832	66,965	69,978
9/2068	52.00	1.00	0.912	0.906	0.826	67,018	69,528
9/2069	53.00	1.00	0.906	0.906	0.821	67,010	69,099
9/2070	54.00	1.00	0.900	0.906	0.815	67,008	68,592
9/2071	55.00	1.00	0.893	0.852	0.761	67,010	64,049
9/2072	56.00	1.00	0.885	0.852	0.754	66,982	63,434

				Preinjury AD			
Mo/Yr	Age	Years	Prob. Life	Prob. Empl.	Prob. Work	Base Earning	Adjusted Earnings
9/2073	57.00	1.00	0.877	0.852	0.747	66,797	62,671
9/2074	58.00	1.00	0.869	0.852	0.740	66,266	61,590
9/2075	59.00	1.00	0.859	0.852	0.732	65,418	60,145
9/2076	60.00	1.00	0.850	0.683	0.581	64,566	47,116
9/2077	61.00	1.00	0.839	0.683	0.573	63,973	46,041
9/2078	62.00	1.00	0.828	0.683	0.566	63,719	45,298
9/2079	63.00	1.00	0.816	0.683	0.557	63,711	44,572
9/2080	64.00	1.00	0.804	0.683	0.549	63,734	43,947
9/2081	65.00	1.00	0.791	0.379	0.300	63,332	23,863
9/2082	66.00	1.00	0.778	0.379	0.295	61,906	22,937
9/2083	67.00	1.00	0.764	0.379	0.290	59,188	21,559
9/2084	68.00	1.00	0.749	0.379	0.284	55,438	19,775
9/2085	69.00	1.00	0.733	0.379	0.278	55,438	19,357
9/2086	70.00	1.00	0.717	0.233	0.167	55,438	11,628
9/2087	71.00	1.00	0.699	0.233	0.163	55,438	11,350
9/2088	72.00	1.00	0.680	0.233	0.158	55,438	11,002
9/2089	73.00	1.00	0.661	0.233	0.154	55,438	10,723
9/2090	74.00	1.00	0.640	0.233	0.149	55,438	10,375
9/2091	75.00	1.00	0.618	0.142	0.088	55,438	6,127
9/2092	76.00	1.00	0.594	0.142	0.084	55,438	5,849
9/2093	77.00	1.00	0.569	0.142	0.081	55,438	5,640
9/2094	78.00	1.00	0.542	0.142	0.077	55,438	5,362
9/2095	79.00	1.00	0.515	0.142	0.073	55,438	5,083
9/2096	80.00	1.00	0.485	0.095	0.046	55,438	3,203
9/2097	81.00	1.00	0.455	0.095	0.043	55,438	2,994
9/2098	82.00	1.00	0.423	0.095	0.040	55,438	2,785
9/2099	83.00	1.00	0.391	0.095	0.037	55,438	2,576
9/2100	84.00	1.00	0.357	0.095	0.034	55,438	2,367
9/2101	85.00	1.00	0.323	0.065	0.021	55,438	1,462
9/2102	86.00	1.00	0.289	0.065	0.019	55,438	1,323
9/2103	87.00	1.00	0.254	0.065	0.017	55,438	1,184
9/2104	88.00	1.00	0.221	0.065	0.014	55,438	975
9/2105	89.00	1.00	0.188	0.065	0.012	55,438	836
Future	**Totals**	**68.32**			**37.990**		**2,694,989**

Citations

Arias, Elizabeth and Jiaquan Xu. National Vital Statistics Reports, vol. 68 no. 7, United States Life Tables, 2017. National Center for Health Statistics, U.S. Center for Disease Control and Prevention, Hyattsville, MD, 2019. https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_07-508.pdf (accessed June 2019).

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